GAS JOURNAL

LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. 204. 85th Year. LONDON, DECEMBER 13, 1933. No. 3682. Price 1s.

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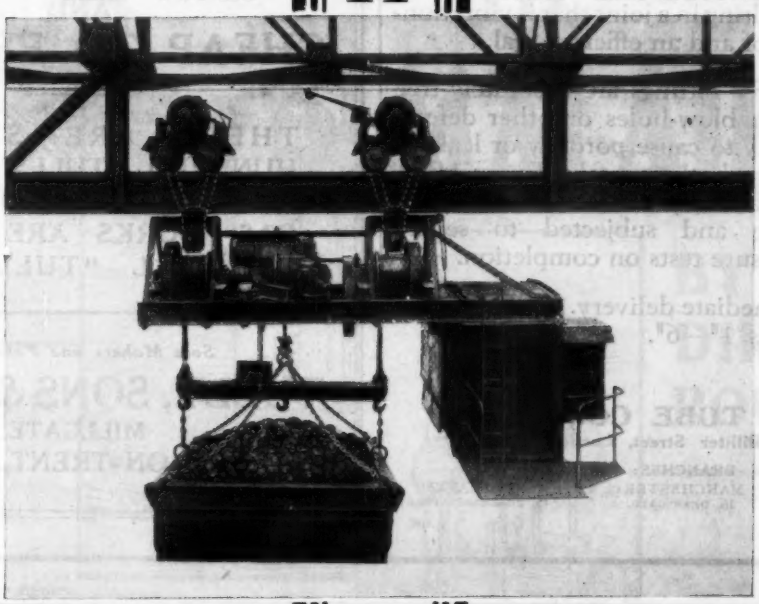

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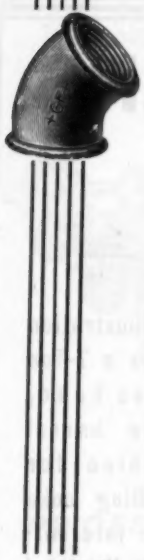

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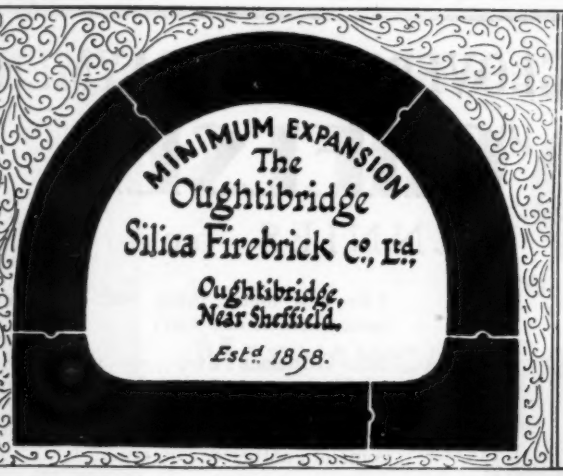

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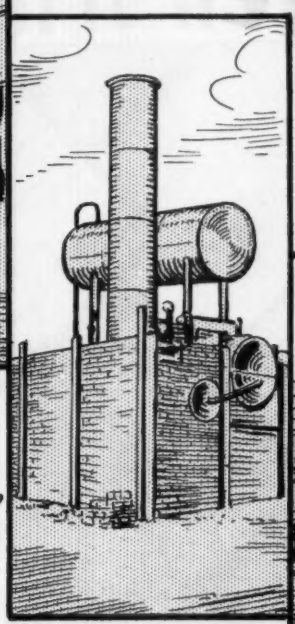

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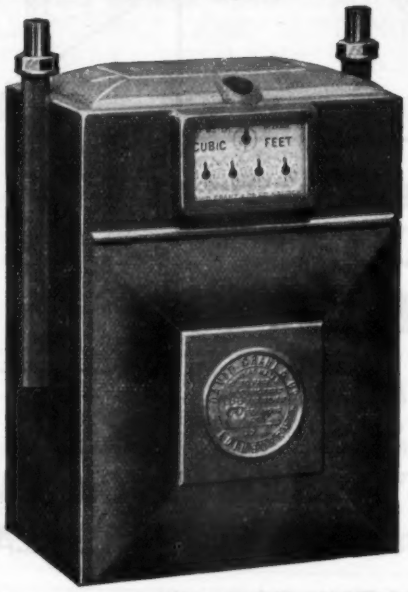

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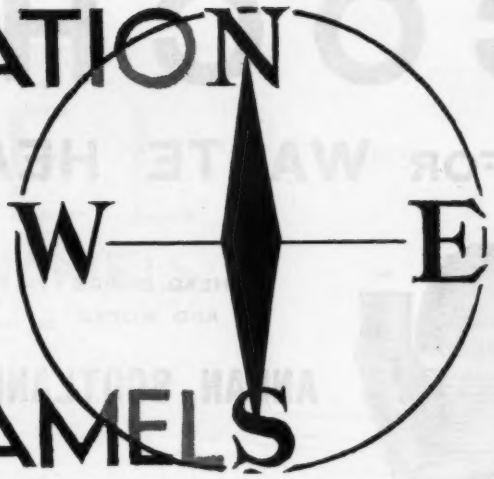

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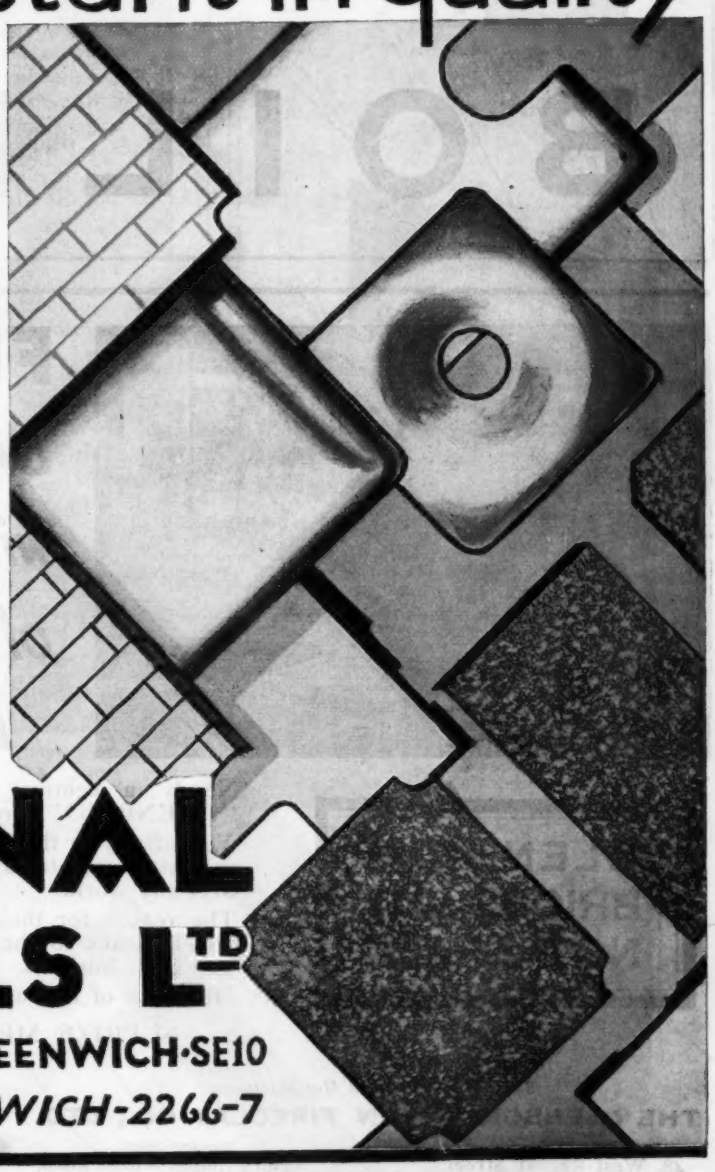

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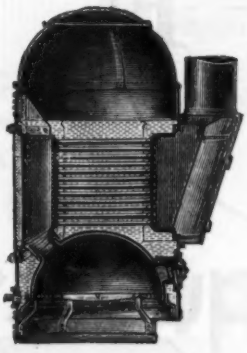

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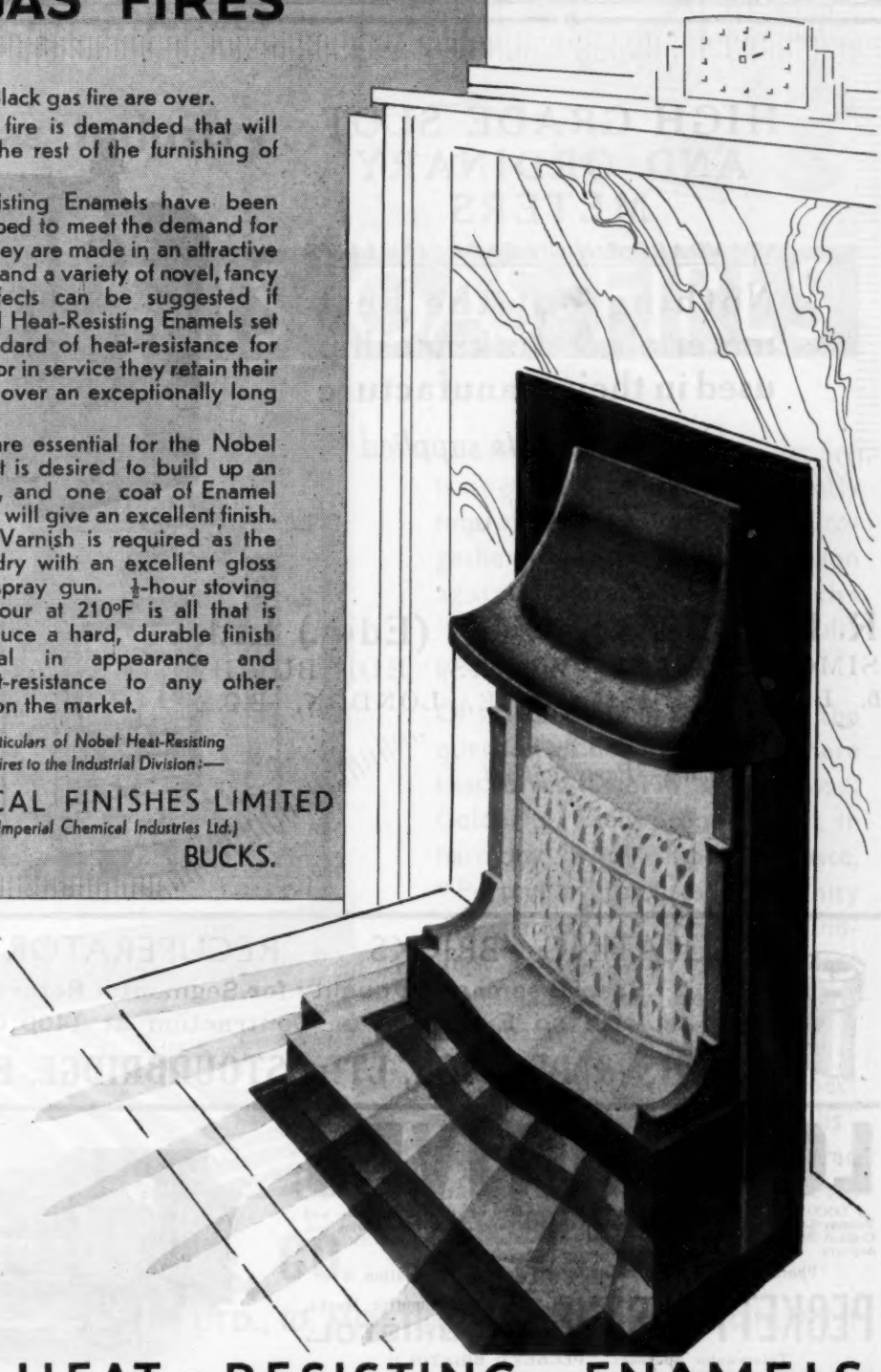

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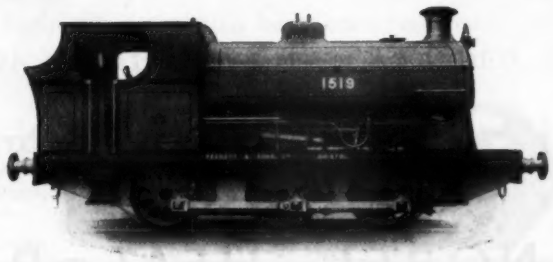

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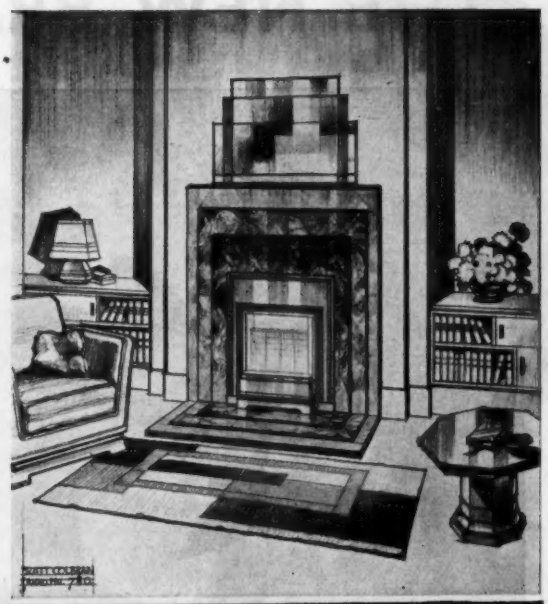

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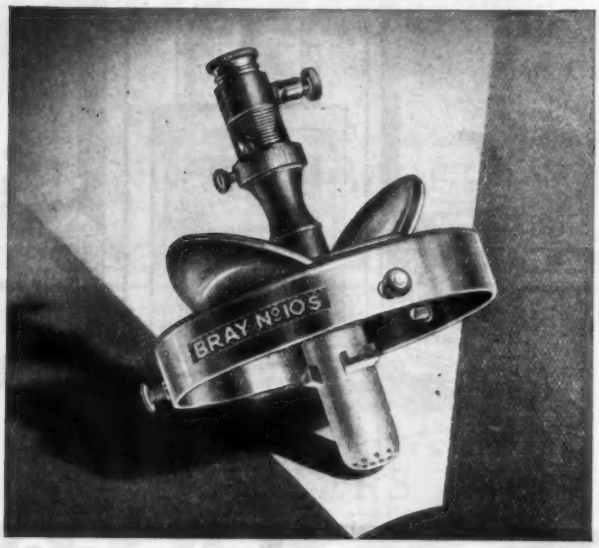

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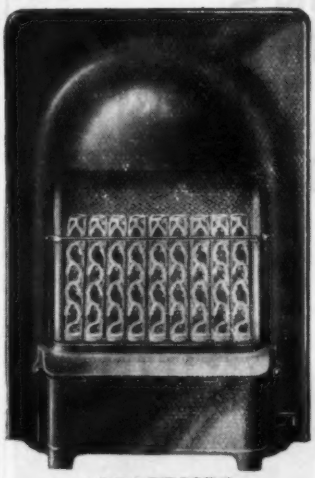

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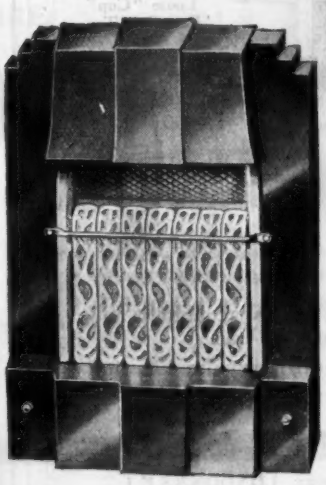

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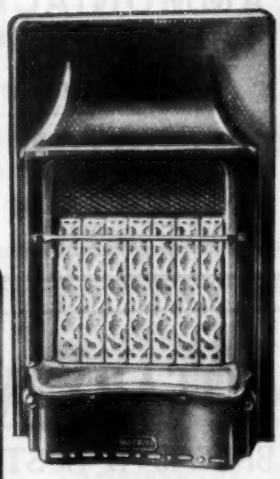

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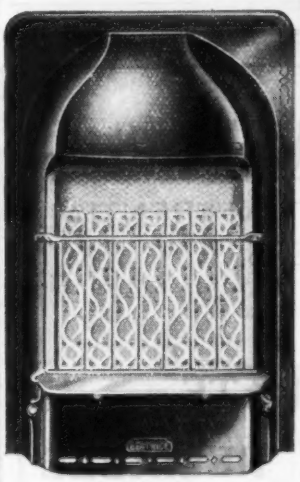

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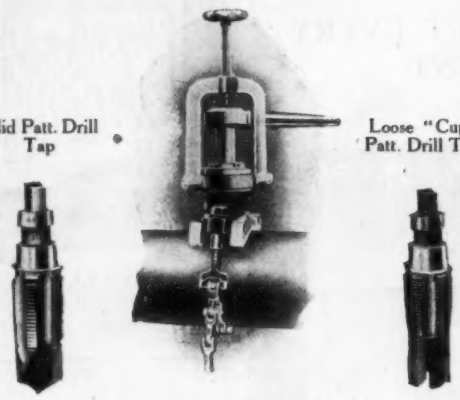

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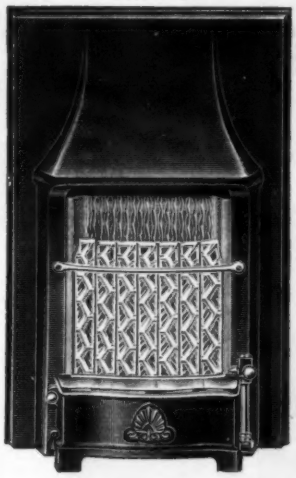

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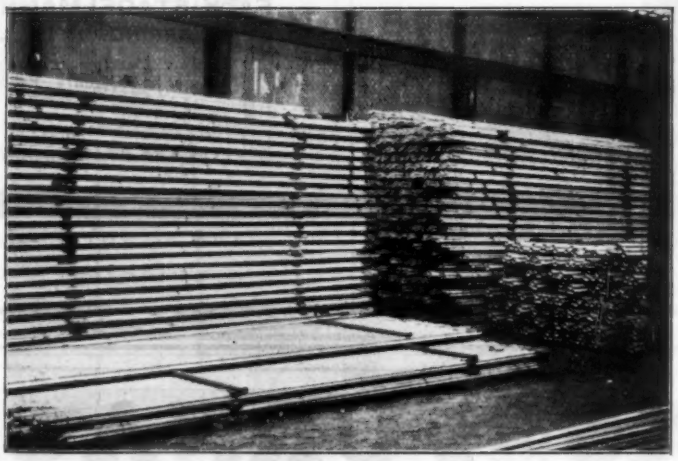

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Fig. 705. "SINGLE RAM" STEAM-PUMP.

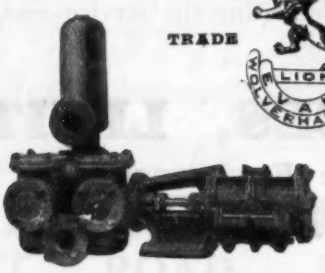

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

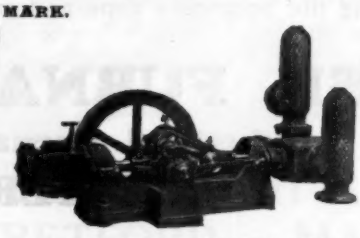

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

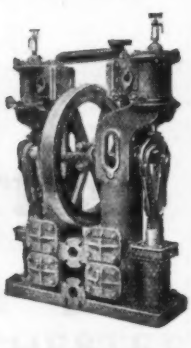

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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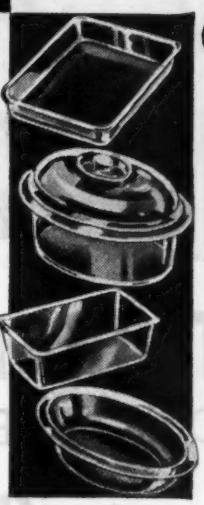
Fireproof Glass Door

Glass Ovenware



THIS up-to-date Vulcan Cooker is bound to make an instant appeal to your customers. The addition of an ARMOURPLATE GLASS door is a practical improvement, for it enables one to see the food in process of cooking, without opening the oven door and letting cold air rush in. The double glass door, heat-resisting and practically unbreakable, is constructed with an intervening air space, obviating condensation of moisture on the glass and maintaining an efficient insulation of the oven heat.

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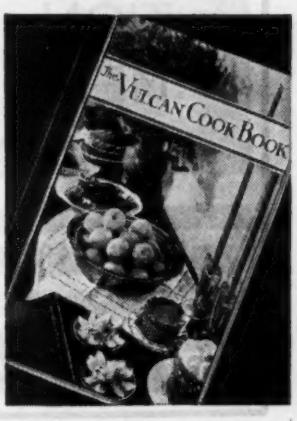
And, as appropriate equipment for this modern glass-panelled Cooker, a set of four pieces of Orlak Fireproof Glass Ovenware is included.

VULCAN STOVES



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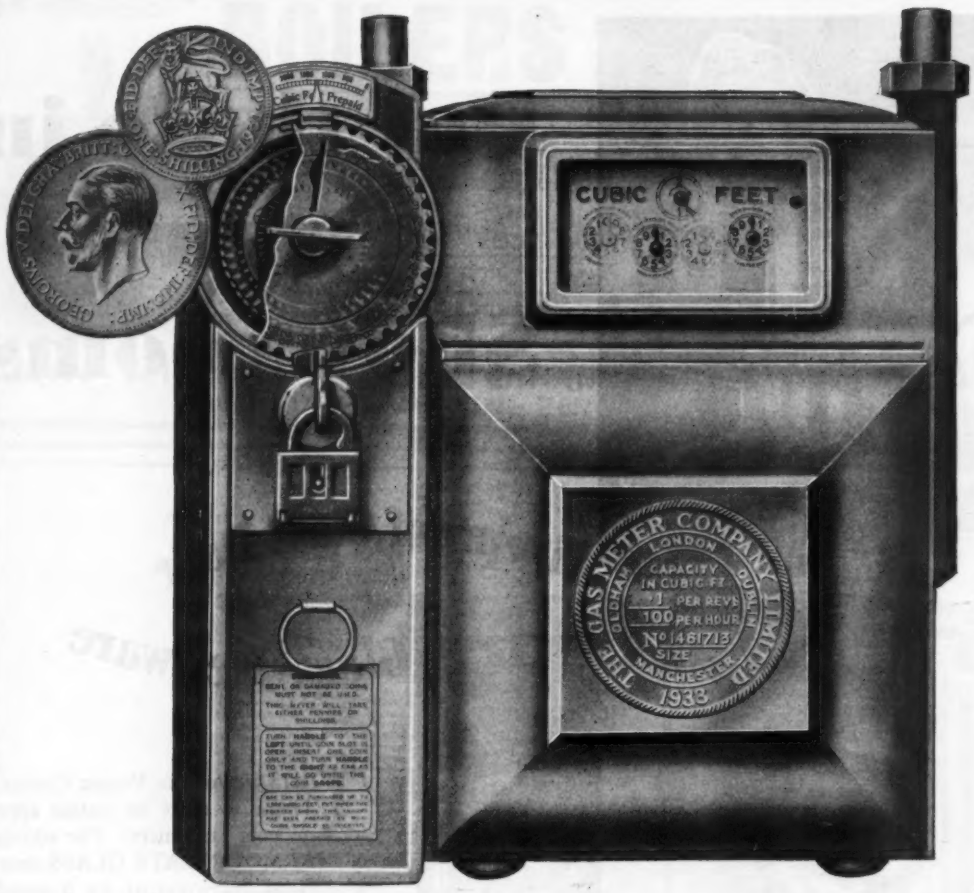

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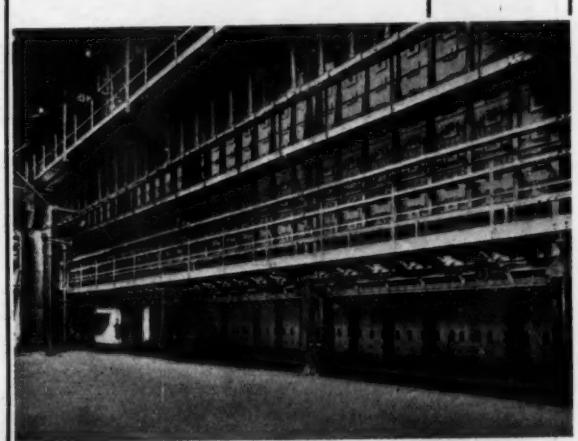

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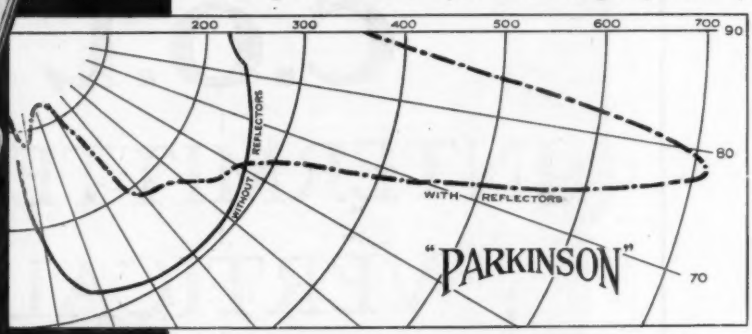

Polar curves showing the improved directional lighting from four No. 2 Mantles by the combined use of STAYBRITE STEEL CURVED TOP and MOR-LITE Reflectors.

For further details, see article in the "GAS JOURNAL," Dec. 6, 1933, pp. 712 and 713.

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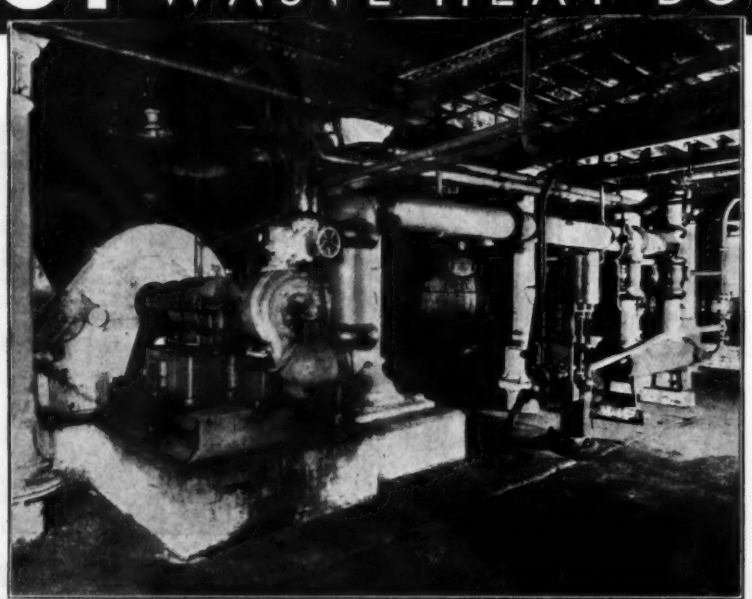

have been supplied to the Gas Companies of Greater London alone.

The illustration shows one of the Boilers operating on Horizontal Retorts at the Beckton Station of the Gas Light & Coke Company.

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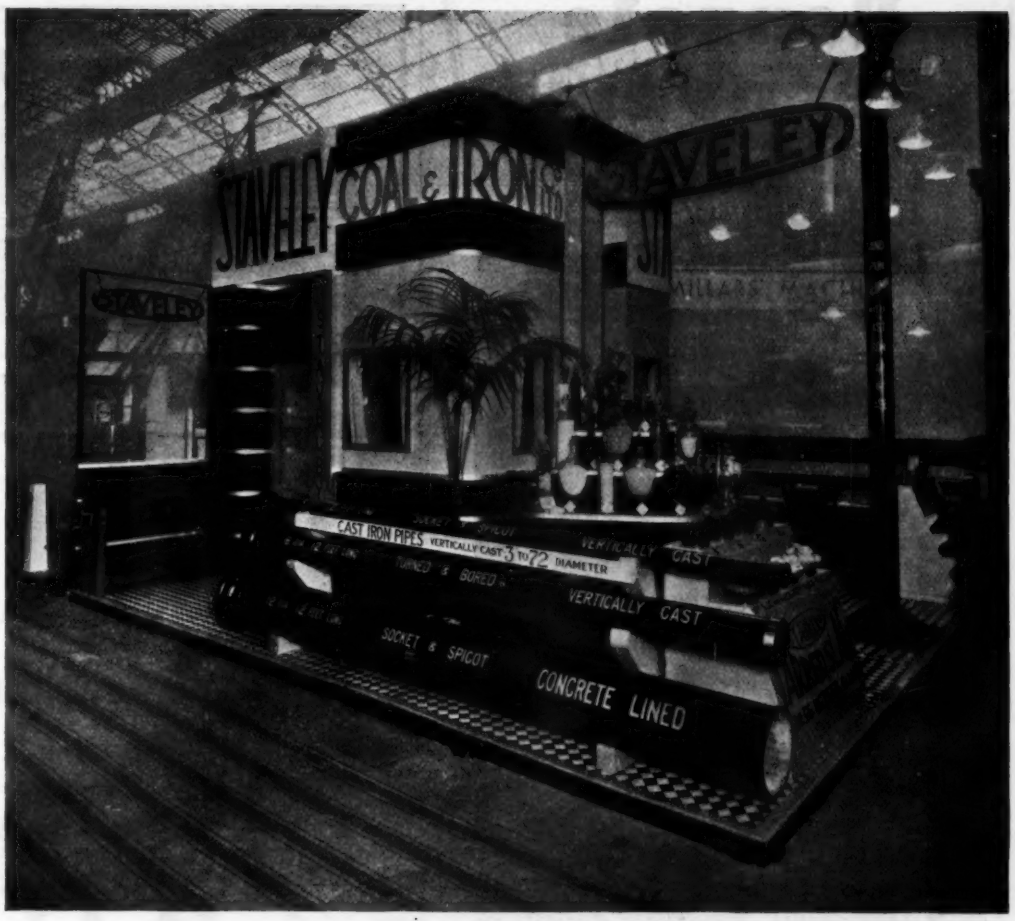

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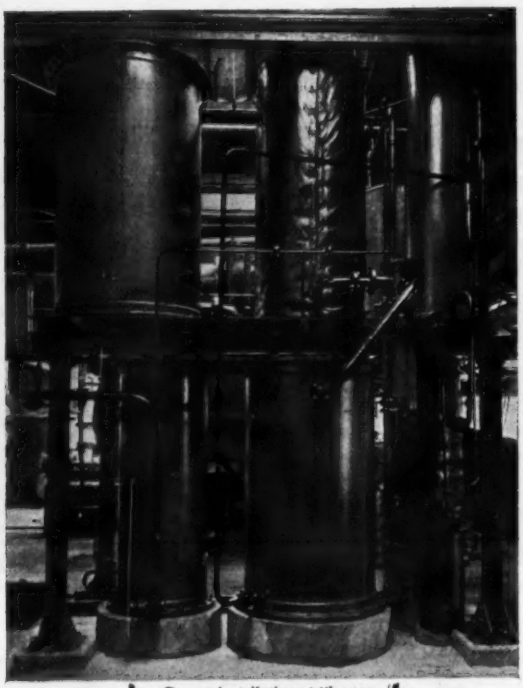

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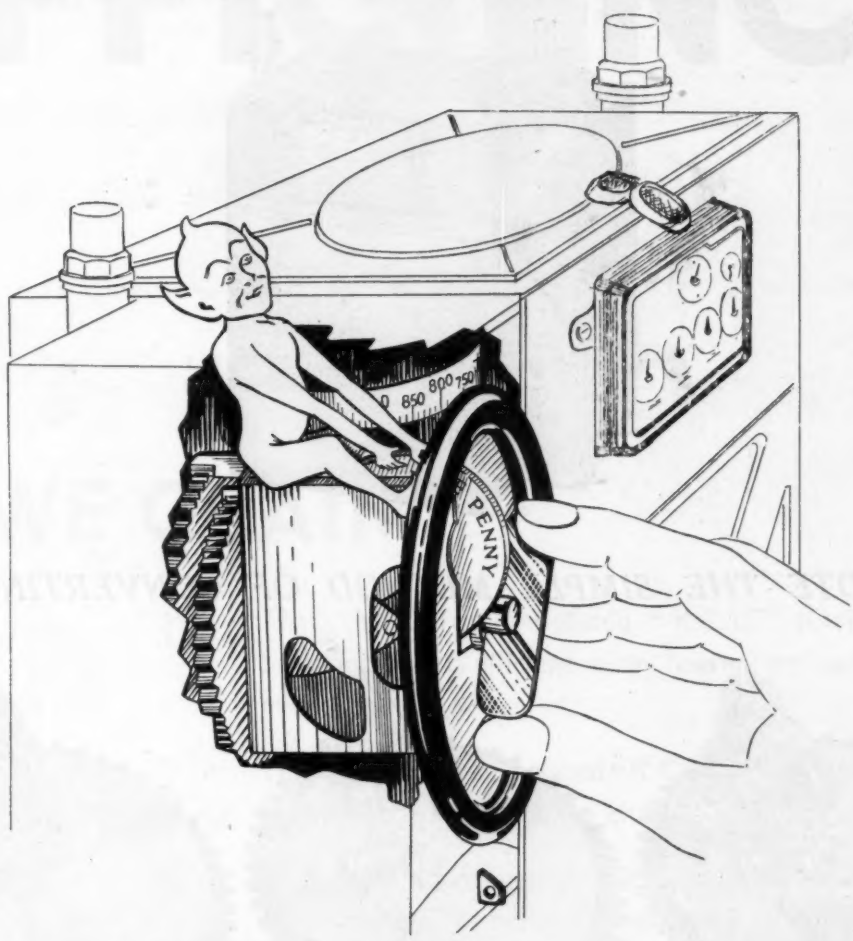

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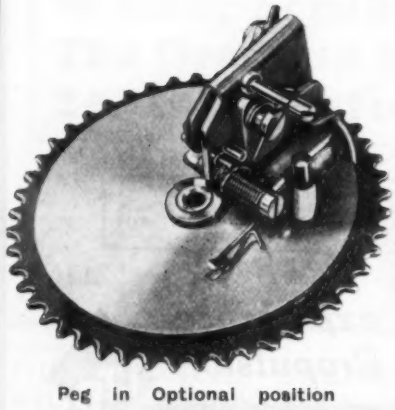
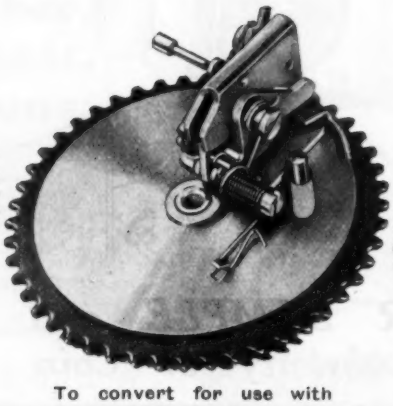
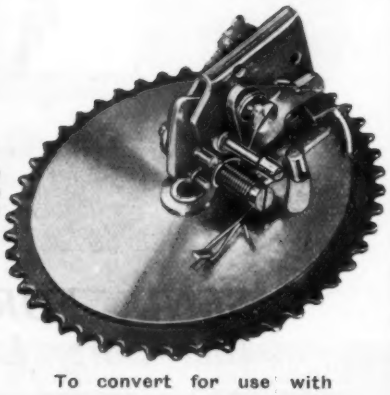


Peg in Optional position for use with either penny or shilling.



To convert for use with shillings only, remove peg and insert in same hole but from opposite side.



To convert for use with pennies only, remove peg and insert in steel cam below coin pocket.

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Gas production per Set, per 24 hours ...	2,394,000	cu.ft.
Calorific value of gas	462	B.Th.U.
Oil used per 1,000 cu.ft.	1·53	galls.
Dry coke used per 1,000 cu.ft.	30·05	lbs.
Fixed carbon actually consumed in generator per 1,000 cu.ft.	26·19	lbs.

This 26·19 lbs. of carbon per 1,000 cu.ft. also produced automatically 65·0 lbs. of steam (from and at 212° F.) for use in the plant, and gasified 1·53 gallons of oil.

The above results, obtained when gasifying coke containing 84·5% fixed carbon, correspond to the following thermal yields* from the raw materials:—

1·32 therms as oil gas from each gallon oil gasified, in addition to residual oil-tar—about 15% of the oil used.

86·4 therms as blue-gas from each 1,000 lbs. dry coke, in addition to the production of the above waste-heat steam and the gasification of the oil.

**Computed by the method described in the Proceedings of The Institution of Gas Engineers, 1927-8, p. 526.*

Humglas House,
Carlisle Place, London, S.W. 1.

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G.J.13.12.33.

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Aluminium has been shown to be eminently suitable for canopies in institutions, restaurants, and similar places where a considerable amount of cooking is done. It resists attack by the products of gas combustion. It is reasonably cheap, light, easily worked and easily cleaned. One of the corollaries of its use is that much lighter supporting structures are required. In cases where it is not possible to make a complete canopy of aluminium because of the lighting and visibility difficulties, it is common practice to use aluminium alloy framework with glass panelling.

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THE GAS JOURNAL

DECEMBER 13, 1933

Vol. 204. 85th Year No. 3682

A Glance at the Contents—

Tar Distillation Plant.

An illustrated description is given of a continuous tar distillation plant by the Chemical Engineering & Wilton's Patent Furnace Company at the works of the Wellingborough Gas Light Company, Ltd. [p. 773.]

Institution of Gas Engineers.

The written contributions to the discussions on the Report of the Gas Education Committee and the Report on Combustion Products from Gas Appliances, presented at the Fifth Autumn Research Meeting of the Institution of Gas Engineers, are published. [p. 777.]

Irradiation of Dough by Gas.

Experiments are being carried out by the Cardiff Central Industrial Laboratory on the irradiation of dough by infra-red rays from gas-heated apparatus at a Cardiff bakery, and the conclusions which have been drawn from three months' observations are set out on p. 763.

A New Gas Fire.

Radiation Ltd. has brought out a new fire which will certainly excite the interest of the Gas Industry. This fire combines pleasing appearance with high efficiency. On grounds both of technical merit in design and construction and of æsthetic appeal the new appliance is an excellent piece of work. It is the logical outcome of previous work on two widely-differing types of gas fire—the "Beam" radiant fire and the "Cobble" "Beam" fire. [p. 772.]

New Members of the Institution.

A list of those who have been elected to membership of the Institution of Gas Engineers in the various classes is given on p. 764.

The Duke of York at Tottenham.

Yesterday H.R.H. The Duke of York inaugurated a new installation of Woodall-Duckham intermittent vertical chamber ovens at the works of the Tottenham and District Gas Company. [p. 767.]

Heating Horizontal Retort Settings.

Mr. H. J. Risby, of the South Metropolitan Gas Company, describes his multiple combustion stage method of heating horizontal retort settings, the idea being to ensure uniformity of heating and increased throughput. [p. 781.]

New Gas Fire Switch.

The Horstmann Gear Company, Ltd., are marketing a new gas fire switch. The method of ignition is based on the electro-catalytic principle, but instead of lighting the fire direct the catalytic element kindles a by-pass, the flame of which is projected across two or three radiants. This by-pass flame is thermostatically controlled, and is reduced to a very small pilot flame after about half a minute. The standard set is provided with 4 ft. 9 in. of operating cable, this being suitable for nearly all requirements, but for bedside control any length of cable up to 48 ft. can be supplied. The fire can be regulated to any required extent by means of the switch. [p. 776.]

Forthcoming Engagements

Dec. 14.—I.G.E.—Meeting of Liquor Effluents and Ammonia Sub-Committee, 2.30 p.m.

Dec. 14.—S.B.G.I.—Meeting of Council, 56, Victoria Street, S.W. 1, 2.30 p.m.

Dec. 14.—SOUTHERN ASSOCIATION (WESTERN SECTION).—Commercial Meeting at Rougemont Hotel, Exeter, 2.30 p.m.

Dec. 15.—I.G.E.—Meeting of Joint Research Committee, 10.30 a.m.

Dec. 16.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Huddersfield. Presidential Address.

Dec. 16.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—Meeting at Cardiff. Paper on "Modern Methods of Manufacturing Malleable Iron Pipe Fittings," by Mr. C. E. Green.

Dec. 20.—B.C.G.A.—Meeting of Executive Committee, 28, Grosvenor Gardens, S.W. 1, 12 noon.

Dec. 21.—I.G.E.—Meeting of Refractory Materials Joint Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Jan. 5, 1934.—I.G.E.—Meeting of Meters Committee, 2.30 p.m.

EDITORIAL NOTES

Heating Horizontal Settings

IN the belief that the methods generally applied in heating settings of horizontal retorts are " fundamentally wrong," Mr. H. J. Risby, in our columns to-day, describes his own system and sets out an interesting case for its adoption. What he seeks to remedy is what he considers as the mal-distribution of heat in normal horizontal setting practice. He considers a setting of ten retorts in two tiers of five, with a combustion chamber temperature of 1350° C., and argues that one-half of the heating surface of the retorts, on the combustion chamber side, has an average temperature of 1300° C., while the other half is at 1075° C., making a mean retort outer surface temperature of 1188° C. Assuming the coke temperature to be 900° C., there is a difference between the outer and inner retort surfaces of 288° C. Thus, with a margin of safety permissible with high-grade siliceous material which allows of a heat transmission factor of 400° C., only 288° C. is available in practice. " Consequently, the equivalent heating surface of the retorts is reduced by approximately 40%." In other words, with uniform heating, an increase in throughput of the setting to the extent of 40% becomes possible. Moreover, uniform heating implies a better coke and better carbonizing conditions.

Realization of what the author terms " these salient facts " led him to investigate a remedy, and the culmination was the introduction of a system of delayed combustion whereby the heating of the setting is effected by multiple stages. The secondary air supply to the heating chamber is restricted so that the primary stage of combustion at the zone of egress of the fuel gases to the chamber is only partially effected. The unburnt fuel gases circulate with the products of the first stage of combustion up through the heating flues to the region of the upper retorts, where a further supply of air or preheated air—" tertiary air supply "—is admitted through ports terminating the preheating flues of a system of recuperation. The completion of combustion of the excess fuel gases results, the products of the complete combustion leaving the flues of the heating chamber by way of a system of recuperation to the main flue. The usual central combustion chamber is the zone of ingress of the total gaseous fuel. Here the partially burnt gases encounter the preheated tertiary air supply at the top of the chamber, and further combustion results.

The effect of the tertiary air combustion system is dealt with by Mr. Risby in relation to the assumed setting to which reference has already been made. As before, the combustion chamber temperature of 1350° C. drops to approximately 1250° C. in the upward passage of the hot gases to the region of the top retorts. At this point the tertiary air consumes the unburnt producer gas, and again the temperature of the heating gases is raised to 1350° C. Once again there is a drop of 100° C. in the downward passage of the combustion products to the recuperator flue inlets. The mean chamber heating temperature is thus 1300° C., well within the margin of safety for ensuring long life of the setting with high-grade siliceous material. With the ordinary method of combustion, states the author, a combustion chamber temperature of 1500° C. would be necessary to maintain a mean heating chamber temperature of 1300° C. Only an all-silica setting could stand up to such a temperature, and then practically with no margin of safety. The tertiary air combustion system thus effects economies in construction. The author claims that, with an efficiently constructed setting having ample grate area in the producer, sufficient heating flue area for the increased volume of gaseous products at higher temperatures, ample flue area for recuperation and for withdrawal of the waste gases, a higher thermal efficiency of carbonization is obtained and there is a saving in the fuel to producers per ton of coal carbonized. There is, he says, a 28% saving of fuel per ton of coal carbonized by the introduction of tertiary air, allowing an 85% recuperator efficiency. Another advantage claimed by Mr. Risby for the tertiary air system is that it facilitates the installation of waste-heat boilers.

Headlights Assist

THE *Daily Mirror* had at the top of its front page last Thursday a well-taken (but naturally very murky) photograph, which was explained as depicting " a car's headlights on to enable a motorist to change a wheel during the darkness at Cricklewood Broadway last night." Another motorist was said by *The Times* to have driven his motor-car up to his dining room window and illuminated the room with his headlights while the family sat at tea; and a builder's office was similarly lighted by a car driven across the pavement.

This assistance was called for by the fact that the Willesden electricity supply, which is obtained from the power station of the North Metropolitan Electric Power Supply Company, was suddenly cut off shortly after 5 o'clock that evening. The whole of Hendon and surrounding districts were stated to have been in darkness for over an hour. The motorists referred to, and probably many others who were inconvenienced, may feel disinclined to subscribe to any suggestion of " pre-eminence of electric street lighting for road safety for drivers and pedestrians." There have, indeed, been quite a string of failures since the appearance of an advertisement to the effect that decisions to light certain thoroughfares by electricity had been arrived at on the ground of this pre-eminence.

An Advance in Gas Fire Technique

AN article on later pages describes an important advance in radiant gas heating, which, like most noteworthy developments, is not of mushroom growth. On the contrary, it is the result of long-continued research applied in practice. The Gas Industry has benefited all along the line by the scientific research and the high standard of engineering of the firms supplying plant for gas manufacture or appliances for gas utilization; and among such firms Radiation Ltd. has always occupied a prominent position. Throughout its existence Radiation Ltd. has pursued with directness the policy of continuous research, and the popularity of the gas fire to-day is largely due to the patient work and singleness of purpose of the firm.

This week Radiation Ltd. is introducing a new fire which will certainly excite the interest of the Gas Industry. This fire combines pleasing appearance with high efficiency. On grounds both of technical merit in design and construction and of æsthetic appeal the new appliance is an excellent piece of work. It is the logical outcome of previous work on two widely-differing types of gas fire—the " Beam " radiant fire and the " Cobble " " Beam " fire. It is now a number of years since Radiation Ltd. envisaged the possibility of an improvement in the quality of the warmth from gas fires and undertook a scientific investigation of the factors which determine the sensations of the human body when exposed to energy

emitted by various radiant heaters. As a result of this work, knowledge was made available of the conditions which conduce to a feeling of increased comfort, and a great step forward became possible in gas fire design. The " Beam " radiants, introduced in 1928, the " Cobble " " Beam " brought out three years later, and the new fire to which attention is here called embody the knowledge so gained.

The new fire—which has a very high thermal efficiency—is to be marketed under the name High " Beam." It combines the special properties of the " Beam " radiant and the " Cobble " " Beam " plaque. In the High " Beam," columnar plaque radiants are employed which become uniformly heated to a high temperature and emit energy rich in short infra-red rays, which are so conducive to comfort and stimulative to health. Above these radiants are curved " scrubber " plaques which abstract from the combustion products a further measure of heat, thereby increasing the radiant efficiency of the fire. A self-lighting gas tap of most interesting design is a welcome feature of the new fire which adds to its appeal.

The Woman's Job

WHILE sipping a cup of coffee during lunch hour not long ago, we were intrigued by an article in the *Evening News* written by Ruth Bowley, who dealt with the subject of the two-job wife. It must not for a moment be thought that we have any intention of dogmatizing on such a thorny question, but we do recall the impression received at the time of reading the article. The authoress described the case of her " friend Jill," who, when she married, decided to carry on with her job. She liked it, and she wanted the money, as her husband's salary was not large. So they agreed to take a small flat " fitted with all the newest labour-saving devices. They had gas fires, an electric cooker, a geyser to heat the water, a vacuum cleaner, and the telephone. Jill arranged for a charwoman to come in for an hour every morning." It all seemed so simple—beforehand. But in the event " she got home tired with the day's work—only to start an endless round of supper making, checking the laundry books, doing the household accounts, and a hundred odds and ends that no charwoman can ever do. This went on for a year. Jill got tired and worried. Her work suffered. The girl who used to be so keen on the job, willing to stay late for rush work, became a worried woman, always anxious to leave the office on the stroke of five." And ultimately Jill gave up her job. Well, our impression on reading the article was just this—that, under the conditions outlined, Jill was a remarkably lucky girl to be afforded this opportunity.

The writer of the article to which reference has just been made does not herself believe it is possible for a woman to run a full-time job and make a success of her marriage, and support seems to be given to this view by a book which we have lately had the opportunity of perusing, written by Mrs. D. D. Cottington Taylor, Director of the " Good Housekeeping " Institute. It is on the subject of " Good Housekeeping with Modern Methods," and it certainly indicates that home management itself contains plenty of material to make up a full-time job. We know Mrs. Cottington Taylor to be an authority on the matters with which she deals so thoroughly, and the book before us—which is Part 1, published at 7s. 6d. net, by the *Good Housekeeping Magazine*, 153, Queen Victoria Street, E.C. 4—may therefore wholeheartedly be commended.

Before we can commence housekeeping, it is necessary, of course, to select the home and arrange for its decoration, and these matters are readably discussed. The same may be said of the questions of room warming, water heating, and cooking; each of these important matters being adequately dealt with. The advantages of gas are duly emphasized, and in this connection we are gratified to note that information of a practical character is quoted from the useful little book by Smith and LeFevre, on the " Domestic Utilization of Gas," published from this office. Years ago, one spoke of " the home beautiful; " now, as Mrs. Cottington Taylor shows by her attractive illustrations, one may particularize down to the point of saying " the kitchen beautiful."

Guiding the Housewife

" TO-DAY," the authoress remarks, " when domestic labour is expensive, ease of cleaning and convenience of working are of considerable importance, and the housewife who undertakes a large part of the daily routine work of a house naturally considers all possible means of conserving energy, and reducing the time which she must devote to cleaning, cooking, and other housecraft tasks. There is no doubt that the woman who realizes the importance of planning and organizing her day can achieve far more in the same number of hours than one who provides herself with no labour-saving equipment and works unmethodically." This planning and organizing are facilitated by the book before us; and the housewife's occupation should be pleasant when the kitchen has been designed and equipped on the model lines laid down. There is a chapter on refrigeration and the storage of food which should receive close attention; for this is a subject that has lagged far behind some others connected with housewifery. " To keep food fresh and wholesome," Mrs. Cottington Taylor tells us, " two conditions are essential—cold and cleanliness." The recital of the principal things from which food must be protected may make uncomfortable reading for some of us, but then it may induce delinquents to " turn over a new leaf," in which case the lesson will have been all to the good. And gas can be used to protect your food—there is a useful consumption here to be secured by those who seek it.

Budgeting the income is dealt with next, but one rather feels that it might have had first place in the book; for most of us these days are compelled to live always with one eye on the housekeeping and the other on the pocket. We must " cut our housekeeping according to our income." However, the chapter is a sound one, and we would earnestly commend " to all whom it may concern " the remark of the authoress that " housewives who have not already experienced the usefulness of keeping careful check on their household and personal expenditure, will probably not realize to the full how very helpful such accounts are in checking undue extravagance." The chapters on organized house-work and marketing must be left to the housewife; while " spring clean " are words on the mere whisper of which the countenance of the bravest man may be expected to blanch. Turning, then, to questions of food and catering (which are dealt with at length), we find much useful information; and the many menus that are set out, and costed to suit pockets of different depths, are particularly prolific in ideas. That section alone would incline us to adopt, with regard to this volume on " Good Housekeeping," the tea-shop suggestion when drawing attention to their cakes: " Take one home with you tonight."

Whether or no home duties be a whole-time job, Mrs. Cottington Taylor's book will make it a better one; and we are glad that she assigns to gas so prominent a place in good housekeeping.

Further Sound Arguments

THE points made in favour of the use of gas in the home are sound, and should go far to induce a decision in its favour; but still further guidance may be secured by the housewife from perusal of a pamphlet on " The Lure of the Grid," by Eileen Murphy. In this the question of whether or not to use electricity in the home is dealt with from the housewife's point of view—the facts being put down as simply and clearly as possible, with the idea of assisting towards a final decision. These plain facts about electricity in the home, " written by a

woman for women," cover many things which should be known to the housewife, in these days of intensive propaganda on behalf of electricity. Faced by capital outlay which has exceeded all expectations, the electricians are keenly on the scent for new business; but there are weighty matters which (though they should be known and carefully remembered) may be overlooked in this scramble, if the Gas Industry does not toil diligently to keep them " in the picture."

In convenient form these important considerations are marshalled by Eileen Murphy, who, in view of the fact that the Electricity Grid has been aided and boosted by the State, maintains that it is a public duty to criticize its shortcomings, while at the same time recognizing that there are directions in which electricity constitutes a vital part of modern life. What she dislikes is " any attempt to stampede the housewife by extravagant promises into buying electricity for household purposes in which it has not yet proved to be economical, healthy, or efficient." These three aspects are discussed in the various short and readable sections comprising the pamphlet—single copies of which are to be had at the price of 3d. each, with a substantial discount on the large orders that gas undertakings will doubtless be wishful to place.

It should be added here that copies of the pamphlet are to be obtained from Messrs. Wightman & Co., Ltd., of 104, Regency Street, Westminster, S.W. 1.

PERSONAL

The County Borough of West Bromwich Gas Committee have appointed Mr. J. DOWNING as Senior Technical Assistant and Mr. N. C. W. ALLIN as Second Technical Assistant, both appointments being promotions. Mr. N. C. W. Allin is the son of the late Mr. J. W. Allin, who occupied the position of Borough Gas Engineer and Manager during the past fifteen years.

* * *

Mr. R. S. FALKNER, Engineer and Secretary of the Sandown Gas and Coke Company, Ltd., was presented with a grandfather clock with Westminster chimes, as a mark of esteem and regard, by the employees on his leaving to take up the appointment of Engineer and Manager at Ilfracombe. The presentation was made by the oldest employee, Mr. W. Dollery, who made a reminiscent speech on the happy relations that had always existed. Messrs. P. H. Compton and W. H. Findon, two of the members of the Board, were present and associated themselves with the tribute.

* * *

The paragraph which appeared on page 702 of the " JOURNAL " for Dec. 6 relating to the presentation to Mr. F. P. Tarratt, Chief Engineer of the Newcastle-upon-Tyne and Gateshead Gas Company, has misled some readers. We should point out that Mr. JOHN F. WEST, who showed the films taken by his father of the recent visit of the Institution to Canada and the U.S.A., is the recently appointed General Manager of West's Gas Improvement Company, Manchester.

OBITUARY

Mr. H. H. BURY, for many years representative of Messrs. Arden Hill & Co., Ltd., died suddenly on Dec. 3 at Barnoldswick. The interment took place at Barnoldswick on Dec. 6.

* * *

The death took place, on Dec. 4, at his residence, 10, Spencer Road, South Croydon, of Mr. GEORGE HANDS, who was the founder, in 1904, of the firm of George Hands & Co., Gas Lighting Specialists, of 67, Farringdon Road, London, E.C. 1. Mr. Hands took a prominent part in Freemasonry. He was a Past Provincial Grand Master of Surrey, and Past Master of the Ewell, Purley, and Croham Hurst Lodges.

CORRESPONDENCE

Open-Grate Coke.

SIR,—I notice that in your issue of Nov. 22 Mr. Theodore Instone objects to certain remarks made by me at the meeting of the Institution of Gas Engineers. I wish to make it clear, as I am sure it was clear to all in the hall, that my remarks contained nothing of a personal nature. They were solely concerned with a particular type of smokeless fuel.

I must in fairness to myself make it clear that I have at present no " dislike " for Coalite. I am entirely neutral and am unassociated with any company interested in the development of any particular smokeless fuel process. Mr. Instone, of course, is not. My attitude to the manufacture of open-grate coke is to be seen from a perusal of a paper recently presented before the Institute of Fuel and the Society of Chemical Industry by Mr. John Roberts and myself. Those who will do us the honour of studying this paper—admittedly written rather from the viewpoint of the colliery than of the gas-works—will see that I have given more thought than Mr. Instone would give me credit for to the conditions necessary for the establishment of the manufacture of open-grate coke on a national basis.

I do not believe that the present methods of low-temperature carbonization provide the best or the ultimate solution of the manufacturing problems involved. For this reason I do not regard it as being in the best interests of smoke abatement that any product now on the market should monopolize public attention. Nor do I think the time has come to set up standards. To set up a standard may make us aim as hign as that standard, but it usually encourages us to aim no higher; it tends to circumscribe progress. Progress must be made in many directions before I, personally, shall be satisfied. Nor do I consider the present methods of marketing to be such as will lead to the early disappearance of smoke from domestic chimneys. But because Mr. Instone's shareholders have put their money into a certain process, that is no reason why he should call me names, because I would not do likewise, and say so.

At the present time the manufacture of open-grate coke is a new and coming industry that might become the particular perquisite of either the coal trade or the Gas Industry. Which will have the foresight to capture it?

Yours, &c.,
G. E. FOXWELL.

42, Tower Road,
Strawberry Hill,
Dec. 9, 1933.

THE NEWS OF THE WEEK

Granton Gas-Works Bowling Club.—Mr. A. Doran presided over a large company at a concert and presentation of prizes recently. The championship cup, presented to the Club by Mr. H. H. Gracie on his recent retirement from the position of Engineer and Manager, was presented to the Club Champion (Mr. Doran) by the donor. Mr. J. Jamieson, the new Engineer and Manager, presented the other prizes.

The Exterior of the New Cinema at Penrith is to be floodlighted with gas, and the lamps are being incorporated in a canopy over the main entrance. This work is under the direction of Mr. J. Corrigan, Engineer of the Penrith Urban Council's Gas Department, who have also supplied gas heaters of the latest panel type, in chromium plating on marble slabs, for the café-lounge, and water heaters and cookers for the supply room. The floodlighting scheme is being provided by a projection from the houses opposite the cinema.

The Formation of a Joint Gas Board has been discussed by representatives of the Ashton Gas Company, Stalybridge Corporation Gas Committee, Dukinfield Corporation Gas Committee, and the Hyde Gas Company. The meeting was held at the suggestion of the Ministry of Health. The Ministry has held in abeyance their sanction or otherwise of the recent application of the Stalybridge Gas-Works Committee to the borrowing of £18,000 for a new carbonizing plant until they are acquainted with the result of this meeting. It is understood that the authorities considered the scheme inopportune.

Gas for Hospital Cooking.—At the last meeting of Lurgan Board of Guardians it was decided that the heating and cooking at the new hospital would be done by gas, and the Lurgan Municipal Gas-Works was given the contract at a flat rate of 2s. 6d. per 1000 c.ft. The decision was reached after views of experts had been heard on the subject from Dr. Bassett, the senior medical officer at the hospital, and Messrs. Ferguson & M'Ilveen, architects, Belfast, who stated that gas was used for the purpose of heating and cooking at the most modern and up-to-date hospitals in Belfast in preference to electricity. The Gas Department was also given the contract for supplying the requisite cooking and heating appliances.

Irradiation of Dough by Gas.

Experiments are being carried out by the Cardiff Central Industrial Laboratory on the irradiation of dough by infra-red rays from gas-heated apparatus at a Cardiff bakery, and the following conclusions have been drawn from three months' observations:

(1) The infra-red rays produced from Radiation clinical lamps stabilize the hydration of the gluten in the dough.
(2) This action increases the percentage of water taken into the dough and produces two to three quartern extra per sack of flour used.
(3) This extra moisture is held in combination with the dough or bread and is not evaporated by the baking in the ovens.
(4) This increased water content keeps the bread moist for several days, so preventing staleness after one day's exposure.
(5) The combination of water with the gluten under the influence of infra-red rays reduces the digestive resistance of the bread. This makes the bread break down more quickly under the action of the digestive juices in the stomach and intestines.

This work has been brought to the notice of various biochemists and analysts conversant with baking practice, and is being investigated jointly.

Consumers of this treated bread express great satisfaction with it, and consider it much more palatable than the ultra-violet radiation bread or the normal variety.

Gas Legislation.

In the House of Commons on Dec. 5, Mr. Lewis asked the President of the Board of Trade for what reason no steps have been taken to introduce legislation in accordance with the recommendations of the Departmental Committee appointed to advise as to the amendment of existing gas legislation.

Mr. Runciman assured Mr. Lewis that "active attention is being devoted to the difficult questions which are involved."

Did You Know?

That of 507 kitchens where cooking is done for the public within the area of the city of Melbourne, 496 use gas? All the big public hospitals in Melbourne also use gas, and Melbourne's most prominent hotel and most exclusive club are big gas users too.

That, according to latest statistics available, there are more than 764,000 gas consumers in Australia?

That a prominent American Gas Company serving a city of two million people reports that, for sales of gas appliances, June was the second best month in the whole 97 years' history of the Company? Depression? Forget it! —*The Colonial Gas Association "Service Messenger."*

New Oil Process.

Important German Discovery.

It was stated in the *Financial Times* of last Monday that the German Dye Trust claims that Germany has found a way to independence of foreign supplies of mineral oil fuels. The discovery—known as the Leuna process—is regarded as of the highest importance.

The Bergius process, which converts heavy into light oils, began from coal as raw material and worked without catalyst (producers of reaction resembling "cracking"). But the new process may start from coal, lignite, crude oil, or tar. This makes the undertaking much more elastic, as it uses raw materials which are plentiful and cheap.

A special article on the new process appeared in the *Financial Times* of the same date.

National Gas Council.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held at the Hotel Metropole, Northumberland Avenue, London, W.C. 2, on Dec. 5—Sir David Milne-Watson, LL.D., D.L., in the chair.

Before proceeding with the business of the meeting, Sir David referred to the loss which the Industry had sustained by the death of Mr. Doig Gibb, O.B.E., M.Inst.C.E. Sir David referred to the services rendered by Mr. Doig Gibb as Technical Adviser to the Department of Explosives Supplies during the war, and the expert evidence which he had given on behalf of gas undertakings before Committees of the Houses of Parliament, which were of great value not only to the undertakings concerned, but to the Industry generally. Sir David said that, apart from his ability, his kindly nature won for him a large number of friends throughout the country, and his memory would long be cherished by them.

In passing a resolution of sympathy with Mr. Doig Gibb's family, the members of the Board stood in silence.

Housing Construction—Revised Manual on Housing Construction issued by the Ministry of Health.—The references in this publication of interest to the Gas Industry were considered, especially those relating to methods of heating. Steps were taken to ensure that the attention of managers

THE NEWS—continued.

of gas undertakings should be specially drawn to this recommendation.

Conjoint Conference of Public Utility Associations.—(*a*) It was decided that the Annual Meeting of the Conference should be held at 28, Grosvenor Gardens, London, S.W. 1, on Wednesday, Jan. 31, 1934, at 3 p.m., under the Chairmanship of the President, the Rt. Hon. The Lord Mount Temple. (*b*) The following six representatives were nominated to serve upon the Council of the Conjoint Conference for the year 1934: Mr. R. Halkett, Mr. S. Lacey, Mr. W. J. Smith (Bolton), Alderman Sir Wm. Kay, Mr. A. W. Smith, and Col. R. L. Norrington.

Boiler Insurance.—A communication was submitted from the Institution of Gas Engineers with regard to investigations which had been made in connection with the attitude of the insurance companies to this risk, from which it appeared unlikely that unreasonable restrictions would be imposed in connection with boiler insurance.

Christmas Cookery Demonstrations at Redditch.

A most successful fortnight of gas cookery demonstrations was concluded on Dec. 1 in the Redditch Gas Company's Showrooms. The demonstrations were conducted by the Company's Demonstrator, Miss C. P. Hill, Diplomée C.D.S., Y.T.C.H. (late of Radiation Ltd.), and the programme consisted chiefly of Christmas fare. The gas cookers used were Radiation "New World" and Cannon's "Cambridge."

The tremendous popularity of gas for cooking was evidenced by record attendances and the number of entrants for the cake-making competition. Several other competitions were also arranged.

The prizes for the various competitions were distributed by Mrs. C. F. W. Rendle, wife of the Engineer and Works Manager.

Sharp Criticism of the Electricity Grid.

The new electricity grid system was severely criticized during a discussion in Manchester between the British Association of Managers of Textile Works and the Bradford Textile Society on the relative merits of electrical and steam driving of textile mills.

Mr. W. Thornley, Managing Director of the Mossley Victoria Spinning Company, stated that costs had gone up under the new system. It was almost unthinkable that the Central Electricity Board, with a vast amount of money at its disposal, a multitude of experts, together with a virtual Government subsidy in rates, should have treated large users as they had done. The grid system was installed to give cheaper electricity, but so far it had failed to do so. Unless they were prepared to grant power users a general reduction of about 25% on the present prices, they would not be competitive with any reciprocating engine, much less the modern turbine or the Diesel oil engine, the latter being no mean competitor.

Gas Progress at Yeovil.

Considerable progress is being made by the municipal gas-works at Yeovil, Somerset. Owing to the rapid growth of the town within recent years the laying down of new plant and new works, which are expected to cost £20,000, have been begun on an entirely fresh site at Yew Tree Close.

Preliminary work has already been started for the building of a new gasholder on the site, which will have a capacity of double that of the largest holder at the existing works. A new 20-in. main connecting the new site with their present works has already been laid by the gas undertaking and when the planned extension mains and branches have been put in the Town Council will be able to bring about considerable improvement in the distribution of gas to local consumers. At present they are being troubled by having insufficient storage.

When the scheme reaches completion the entire gas-making plant in Yeovil will be transferred to new works on the new site, though it is intended to spread the carrying out of the scheme in full over the next ten years.

As a trading concern the Yeovil gas-works are paying their way, and it is considered the growing demand for gas will enable all these improvements to be carried through without any additional cost falling on the rates.

The Sheffield Gas Grid.

In the House of Commons on Dec. 5, Mr. Chorlton asked the President of the Board of Trade what progress had been made with the gas grid of the Sheffield Gas Company.

Mr. Runciman said that the Company had laid approximately 12¼ miles of grid mains, which link up three coke ovens, and that steps are now being taken with the object of adding another 10 miles of main to the grid system in order to bring in two more coke oven plants. The quantity of grid gas purchased during 1933 is, he understood, estimated at 1637 million c.ft.

Institution of Gas Engineers.

Elections to Membership.

The following have been elected to membership of the Institution in the different classes:

To Membership.

Foxwell, Geoffrey Edwin, D.Sc., Carbonization Consultant, 42, Tower Road, Strawberry Hill, Twickenham.
Monks, John, Engineer and Manager, County Borough of Wigan Gas Department.
Wilton, Thomas Owston, Joint Managing Director, the Chemical Engineering and Wilton's Patent Furnace Company, Ltd., 76, Victoria Street, London, S.W. 1.

To Associate Membership.

Allin, Norman Conway Watson, Technical Assistant, West Bromwich Corporation Gas Department.
Downing, James, Technical Assistant, West Bromwich Corporation Gas Department.
James, Cyril, Works Assistant, City of Salford Gas Department.
Jones, Stanley, Shift Engineer, Blackpool Corporation Gas Department.
King, Francis Holden, Engineering Assistant, Rochdale Corporation Gas Department.
Leather, Arnold John, Works Draughtsman and Engineering Assistant, Blackburn Corporation Gas Department.
Lord, Joseph Frederick, Engineering Assistant, Darlington Corporation Gas Department.
Marshall, James Saddle, Shift Superintendent, Preston Gas Company.
Mitchell, John Kenneth, Senior Technical Assistant, Brighouse Corporation Gas Department.
Pearce, Kenneth Leslie, Assistant Engineer and Manager, the Bilston Gas Company.
Ross, Louis Alfred, Assistant Works Superintendent, Portsmouth Gas Company.
Snowdon, Kenneth, Assistant Manager, Musselburgh Gas Company.
Spencer, Herbert, Engineer and Manager, Barnoldswick Urban District Council Gas Department.
Warne, George Garnett, Technical Assistant, Portsmouth Gas Company.
Williams, Walter, Engineer and Manager, Tipton Urban District Council Gas Department.
Wilson, Ian Mackenzie, Junior Assistant Engineer, Croydon Gas Company.
Wright, Hubert Ivan, Second Technical Assistant, Luton Gas Company.

To Associateship.

Platt, Frank, Engineer and Manager, Hayfield Gas Company, Ltd.
Pritchard, William Frederick, Assistant Inspector, Tottenham and District Gas Company.
Randall, Lancelot Frederic, District Industrial Gas Representative, South Metropolitan Gas Company.
Wilkinson, Thomas Beavon, B.A., Junior Technical Assistant, Stroud Gas Light and Coke Company.
Wimhurst, John Collard, Technical Assistant, Newcastle Gas Department, Staffordshire.

Gas Exhibition at Barrow.

Under the auspices of the Barrow Corporation Gas Committee, a three days exhibition of modern gas appliances, with a series of gas cookery demonstrations, attracted a large number of people to the new Public Hall, Barrow. The exhibition was a preliminary to the opening of the Gas Committee's first showroom, in premises in Cavendish Street, Barrow, almost opposite to the Corporation Electricity Committee's offices and showrooms.

The opening of the gas exhibition was well supported. Councillor Clement, Chairman of the Corporation Gas and

Water Committee, presided, and he said that the exhibition had a special function in this respect, that the various exhibits placed before them were not only to satisfy the eye but to show them that efficiency was a factor, and that every apparatus had been brought up to the very highest standard through the channels of research, both in engineering and science. Every effort had been put forth by the suppliers of the apparatus to anticipate requirements.

The Mayoress of Barrow (Mrs. Morton) said she was always pleased to do all she could to encourage or help anything for the good of their town and townspeople. For that reason only she was glad to be there on that occasion for the purpose of declaring the exhibition open.

A vote of thanks was accorded to the Mayoress on the motion of Councillor Yeomans.

The Mayor of Barrow (Alderman T. Morton), in reply, said: "The Gas Committee have at last realized this very vital point, and I believe that even in Barrow-in-Furness there are still quite a lot of homes that have neither gas or electricity, so far as cooking is concerned. Many of the people in those homes will certainly have the advantage now of having prominently displayed before their eyes the latest gas appliances for this and other uses. That is all to the good, and I believe by this excellent innovation the Gas Committee will certainly receive a great deal of benefit."

Miss A. A. Andrew, Cordon Bleu, N.T.S.C., was introduced and gave the cookery lectures and demonstrations.

The appliances exhibited were those of Messrs. R. & A. Main, Ltd., of London and Falkirk, and included the latest in cookers, in various enamelled finishes, and of many types; gas fires, panel heaters for the garage, radiators, wash boilers, &c.

British Industries Fair Joint Gas Conference.

Preliminary Programme.

The Joint Gas Conference at the British Industries Fair will be held on Tuesday, Wednesday, and Thursday, Feb. 27, 28, and March 1, 1934, at Castle Bromwich, when the following preliminary programme has been arranged.

Tuesday, Feb. 27.

10.15 a.m.	Assemble at Conference Hall, British Industries Fair, Castle Bromwich, Opening of Conference.
11. 0 a.m.	Presidential Address by Sir Francis Goodenough, C.B.E.
1. 0 p.m.	Official Luncheon at the British Industries Fair (delegates paying for their own luncheon).
Afternoon.	Inspection of exhibits at the Fair.

Wednesday, Feb. 28.

10.15 a.m	Assemble at Conference Hall, British Industries Fair.
10.30 a.m.	Address by Dr. E. W. Smith, C.B.E., F.I.C., on "Relationship of the Gas Industry to the Future of the Coal Industry." Discussion.
1. 0 p.m.	Luncheon at British Industries Fair by invitation of the Birmingham Chamber of Commerce and the Fair Management Committee.
Afternoon.	Inspection of exhibits at the Fair.

Thursday, March 1.

10.15 a.m.	Assemble at Conference Hall, British Industries Fair.
10.30 a.m.	Address (to be announced later). Discussion. No special arrangements are being made for Luncheon.
Afternoon.	Inspection of exhibits at the Fair.

Members wishing to attend are advised to apply immediately for accommodation to the Accommodation Department of the British Industries Fair, Chamber of Commerce, New Street, Birmingham. Free admission tickets to the Fair and railway vouchers at reduced rates will be available.

Gas Supply on Merseyside.

At a meeting of the Liverpool Group of the Institute of Public Administration on Friday last, Mr. R. E. Gibson, Chief Engineer to the Liverpool Gas Company, was to have read a paper dealing with gas supply on Merseyside. Unfortunately Mr. Gibson, owing to indisposition, was unable to attend, and the paper he had prepared was presented by Mr. Ernest Astbury, the Assistant Engineer.

The public utility service of gas supply on Merseyside, it was related, dates back to the year 1816, Liverpool being one of the first towns to adopt gas lighting. Since then the business of gas supply in and around Liverpool has steadily grown, until it has reached its present large dimensions.

Since its inception the supply of gas on the Liverpool side of the Mersey has been carried on by Companies with one exception; the supply to Fazakerley from 1908 to 1915 was undertaken by the Liverpool Corporation. In 1915 the Fazakerley Gas Undertaking was transferred from the Liverpool Corporation to the Liverpool Gas Company. Since then the Company has further extended its borders by taking in Hightown in 1924, Woolton in 1926 with the additions of Halewood and Speke, and in 1932 the Huyton and Roby Gas Undertaking with the inclusion of Croxteth Park, Kirkby, and part of Simonswood.

On the Cheshire side of the river the whole of the gas supply is in the hands of the Local Authorities, Birkenhead, Wallasey, Hoylake, and Ellesmere Port. Further up the river the gas service is undertaken by a Company—the Runcorn Gas Company.

The total number of consumers supplied with gas by the four Local Authorities on the Cheshire side of the River is about 79,000, compared with nearly three times that number on the Liverpool side.

The advantages of federation, or joint working, the paper stated, are many. Economies can be effected by operating in larger units, there are greater financial resources, there are possibilities of improved efficiency, there are economies to be gained by purchasing materials in large quantities, manufacturing charges can be reduced, savings can be effected in standing charges, and a more highly trained and experienced staff can be employed. Certain difficulties that arise in laying mains and services at or near boundaries are overcome. Other advantages are unification of control, uniformity of price and quality, reduction in price especially in the outlying districts, a larger area giving greater scope for distribution and sales organization.

Unification of control presents many advantages, prominent among them being the power which it confers of giving "direction." Where centralized "direction" exists not only can comprehensive long-term policies be framed and executed with greater ease, economy, and harmony, but their execution can be more rapidly and satisfactorily carried out than when small units are acting separately.

Floodlighting Posters by Gas.

The Southampton Gaslight and Coke Company have recently acquired a prominent poster site for the purpose of demonstrating the advantage of gas for floodlighting. They are illuminating a 48-sheet double-crown poster, advertising gas fires, by means of a powerful strip light, and the result is highly satisfactory, as can be seen from the photograph.

East Surrey Company's Co-Partnership.

Increased Dividend.

The general meeting of co-partners of the East Surrey Gas Company was held at the Redhill Small Market Hall, when the twentieth annual report disclosed another record of progress, gratifying alike to the directors of the Company and to the co-partners. Mr. G. R. Hunt, J.P. (Chairman of the Committee), presided, while among those also present were Messrs. W. Lees Stenning, J.P. (Chairman of the Company), W. H. Bennett (Managing Director), Harrie Stacey, J.P., R. H. Mew, and J. Urquhart (Directors), Horace Long (Hon. Secretary to the Committee and Secretary to the Company), Ernest Scears (Chief Engineer), Arthur Tennant (Sales Manager), and co-partners from Redhill, Reigate, Godstone, Lingfield, Walton-on-the-Hill, Dorking, and Capel.

The Committee, in their annual report, recorded that the number of co-partners registered at June 30 last was 230. The bonus and interest for the past year amounted to

THE NEWS—*continued.*

£2166, and savings deposits increased by nearly £400 during the year. During July, the usual time for allocating further Capital Stock for the purpose of the scheme, the co-partners were particularly fortunate in securing their allotments at the rate of £100 per £100 stock. The market value was then £120 10s. per £100; and this great advantage in the price to the co-partners was due to the fact that the trustees had bought stock, considerably in excess of requirements, before the market value had risen above par. Co-partners invested in the Company during the year the sum of £2726, being £521 more than the amount so invested in the previous year. The "B" ordinary stock acquired under the scheme up to June 30 last amounted to £14,155, and subsequent transfers had brought the total up to £15,980, divided among 222 co-partners.

The Chairman, having extended a hearty welcome to the co-partners, said it was most satisfactory to record that the dividend paid on the ordinary stock for the year 1932 was at the rate of 6% per annum, which automatically raised the co-partnership bonus to the same rate, compared with 5¾% for the previous year. Savings deposited, partly for investment in the Company's stock, would appear to have gone up by leaps and bounds. The amount reached £1330, which has only been once exceeded. In July last the sum of £1925 "B" stock was allocated to co-partnership, and subsequently allotted to the co-partners individually, increasing the total amount of stock held by them to £15,980.

The principle of co-partnership and profit-sharing, concluded the Chairman, from first to last, was good policy and good business. He had no hesitation in saying that the prevalent feeling between the Directors and the "rank and file" in the Company was one of hearty goodwill; and his colleagues and himself sincerely appreciated the loyal and true service of their co-partners one and all. He then moved that the Committee's report and the statement of the Trustees' accounts be approved and adopted.

Mr. F. H. Higton (Dorking) seconded the resolution.

Mr. W. Lees Stenning then presented certificates which had been gained during the year by employees of the Company, after which he proposed a vote of thanks to the Chairman, Committee, Officials, and Auditors.

Visit to Gothic Works, Falkirk.

The Scottish Junior Gas Association (Eastern District) enjoyed the privilege of visiting the Gothic Works of Messrs. R. & A. Main, Ltd., on Dec. 2. Members of the staff conducted parties over the works, following the sequence of manufacture from the pattern and moulding shops through the enamelling and fitting departments to the passing and "Mainstat" departments.

A skeleton staff had been retained, and the opportunity of seeing the actual operations of stamping, machining, enamelling, &c., was appreciated. The methods of obtaining the very fine enamel finishes were of particular interest. A gas-fired furnace consuming 23 million c.ft. per annum has recently been installed in the enamelling department and is giving excellent results.

Methods of testing and proving the latest designs in appliances were demonstrated in the Laboratory, and a fine range of finished fires and cookers was on view.

Tea was provided in a local restaurant, and Mr. Aird, Managing Director, welcomed the visitors.

The President, Mr. W. Scott (Tillicoultry), conveyed the Association's thanks for the firm's hospitality.

A cinema display of the details of manufacture and design of the many appliances, along with some topical films, concluded a most enjoyable visit.

Solid Smokeless Fuel.

A Joint Meeting of the Manchester District Association of Gas Engineers and the North-Western Section of the Institute of Fuel was held on Wednesday, Nov. 29, at the Engineers' Club, Manchester. Mr. G. Dixon, B.Eng., A.M.Inst.C.E., President of the Manchester District Association of Gas Engineers, presided, and he was accompanied by Mr. E. Watson Smyth, Chairman of the North-Western Section of the Institute of Fuel.

A Lecture entitled "Solid Smokeless Fuel" was delivered by Dr. E. W. Smith, C.B.E.

The Lecturer stated the use of solid fuel was sure to be general for many years to come. The majority of the grates in the country, of which there were some millions, had been designed for coal, and any industry which had for its objective the production of a solid fuel as an alternative to coal must produce a fuel which would burn acceptably in already existing grates, although it was not necessary to provide for the worst type of grate.

A satisfactory fuel depended as much on the selection of coals as on the selection of plant in which the coal was carbonized. The fuel should be suitably graded, readily ignitable, and be of high combustibility. Its ash content should not be much higher than that of good household coal.

Radical changes for the better in the gas and coking industries in the production of improved coke were dealt with, and the materials compared, on broad lines, with low-temperature products. The possibilities of the gas and coking industries adopting methods of low-temperature carbonization were also discussed, and an examination was made of processes for low-temperature carbonization which had attracted attention in recent years.

The Gas Industry and Domestic Coke.

There were about 40 million tons of fuel used in the domestic grate at the present day, while the Gas Industry carbonized about 18 million tons of coal, making about 9 million tons of coke. The Industry had a ready market for well over 8 million tons of that 9 million tons, so that even if they wanted to supply the market for the domestic grate there was only one million tons available for the purpose. The question arose as to whether the Industry should endeavour to produce a coke which was specialized for that particular market, because there would always be a demand for industrial coke. It must be borne in mind, however, that the first objective of the Gas Industry was to produce cheap gas, and any change of policy which might tend to increase the cost of gas would be a wrong policy from the point of view of the Industry as a whole.

The lecturer stated that his view was that the Gas Industry should continue to improve its coke, but not at the expense of gas production costs. If they desired to be the purveyors of another type of fuel which might be called a low-temperature coke, then they would have to consider the question from the point of view of the process as a process distinct altogether from the Gas Industry.

The Gas Industry was producing the best coke fuel that could be produced at the present day at the lowest price, subject to the fires being of a fairly large type. There were certain objections to the coke that he would like to see overcome, such as the crackling of the fire and the metallic noise as the pieces of coke fell down when the fire was burning, while there was also a little more delay in getting a coke fire to burn up brightly than was the case with a coal fire.

Development of Gas Industry in Ipswich.

The part of Ipswich in the history of gas was brought out by Mr. G. A. Mallett (Secretary to the Ipswich Gas Light and Coke Company) in a talk to the Rotary Club of Ipswich last week.

In Ipswich in 1817 a small body of influential men, including Messrs. Robert and James Ransome and Mr. John Talwin Shewell, established a gas-works in a corner of the foundry which was then in Old Foundry Road. They appointed as the first Manager Mr. William Cubitt, of the Orwell Works, who became a famous engineer.

Mr. Ebenezer Goddard, thrice Mayor of Ipswich, and father of the late Sir Daniel, was one of the real pioneers in the manufacture of gas cookers and gas fires. "If the making of gas cookers and other appliances had been followed up in Ipswich a little later, no doubt a very large manufactory would have been established there," said Mr. Mallett.

The price of coal to-day was three times that of fifty years ago, and yet the price of gas in Ipswich was only half what it was then. Ipswich was one of the first towns to adopt the incandescent burner for street lighting, also the slot-meter, and was the first town in Britain to erect one of the new waterless gasholders.

Eighth List of Bookings for Film "The Highway."

The following provisional bookings for the British Road Tar Association's film, "The Highway," have been made—subject to local variations and contingencies—for three days' showing at each theatre, unless otherwise stated:

1933.
Dec. 17.—Aberdeen Walk, Scarborough (1 day).
,, 18.—King's, Oswestry.
,, 18.—Empire, Mexborough.
,, 18.—Savoy, Southwick.
,, 21.—Empire, Anstruther.
,, 21.—Empire, Camberwell.
,, 25.—Gainsboro', Leeds.
,, 25.—Western Theatre, Methil (6 days).
,, 25.—Avondale, Strathaven (2 days).

H.R.H.

The DUKE OF YORK

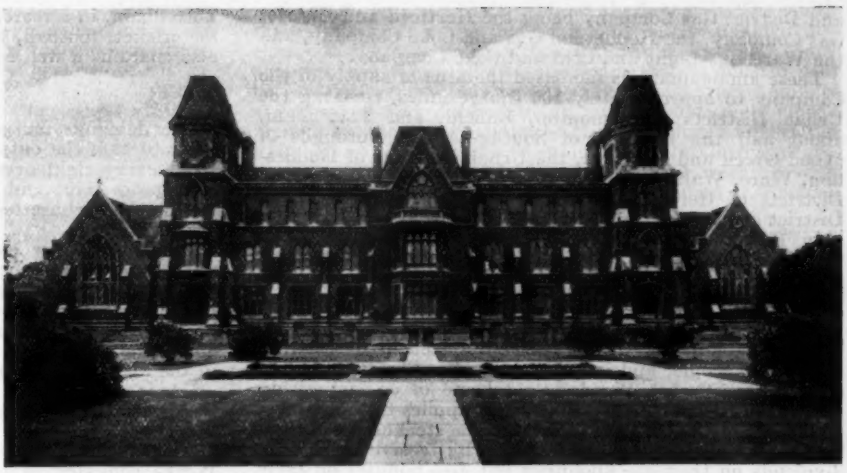
INAUGURATES

NEW PLANT

AT

TOTTENHAM.

Woodall-Duckham Intermittent Vertical Chambers.



Woodall House—the Chief Offices of the Tottenham and District Gas Company.

Further evidence of the interest shown by the Royal Family in vital British industries was given at Tottenham yesterday when H.R.H. the Duke of York visited the Willoughby Lane Works of the Tottenham and District Gas Company to inaugurate the new Woodall-Duckham intermittent vertical chamber oven plant.

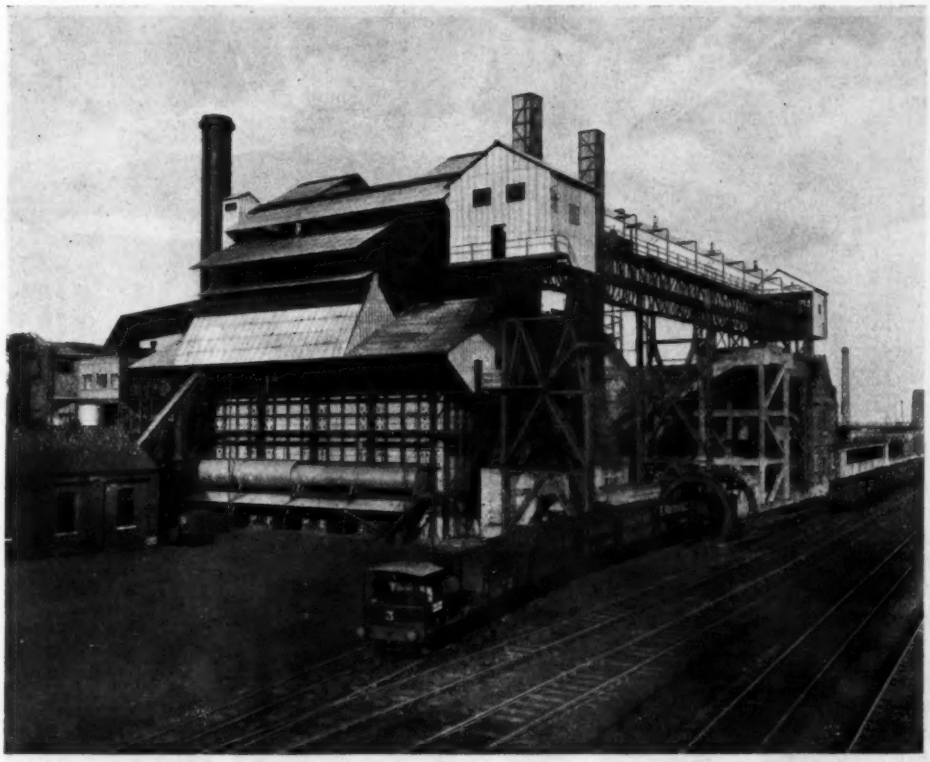
The foundations of the Tottenham and District Gas Company were laid in 1845, when Mr. Alexander Angus Croll, who was at that time Superintendent of the Brick Lane Works of the Chartered Gas Company, obtained a concession from the Imperial Gas Company to supply the districts of Tottenham and Edmonton (which then included Wood Green and Southgate). He procured a site, for manufacturing purposes, of barely 1½ acres, which is now at the extreme southern end of the works.

Mr. Croll was a pioneer in the Gas Industry, and at Tottenham he applied many of his inventions. The retort settings first erected at Tottenham were of his duplicate type, as described in "King's Treatise."

Formation and Growth of Company.

The Tottenham and District Gas Company was successfully started by a deed of settlement dated Dec. 21, 1847, with a nominal share capital of £25,000, under the name of the Tottenham and Edmonton Gas Light and Coke Company. It existed as a non-statutory Company until Aug. 1, 1859, when Royal Assent was given to its first Act.

Under the Tottenham and Edmonton Gas Act of 1913 an amalgamation took place with the Enfield Gas Company. Under the same Act the Wood Green Electric Lighting Order of 1902, which empowered the Urban District Council of Wood Green to supply and distribute electricity within the Urban District of Wood Green (which powers had never been exercised), was transferred to the Company, who from that date until Dec. 31, 1932, supplied electricity in the Wood Green area. Under the Tottenham and District Gas Act of 1928 an amalgamation was effected with the Waltham and Cheshunt Gas Company, and the name of the Company was changed to the Tottenham and District Gas Company. Under the Tottenham and District Gas Order of 1932 further amalgamations were effected, the additional Companies now forming part of the Tottenham



GENERAL VIEW OF THE NEW PLANT FROM THE SOUTH EAST.

Showing the Settings of Intermittent Vertical Chambers, the Coal Wagon Tippler and the Coke Transporter and Wharf.

and District Gas Company being the Hertford and District Gas Company, the Hoddesdon Gas and Coke Company, and the Ware Gas Light and Coal and Coke Company.

These amalgamations increased the area of supply of the Company to approximately 100 square miles, covering the Urban Districts of Edmonton, Enfield, and Tottenham, about half the Borough of Southgate, the Boroughs of Wood Green and Hertford, the Urban Districts of Hoddesdon, Ware, Waltham Holy Cross, and Cheshunt, the Rural Districts of Hertford and Ware, and part of the Rural District of Epping.

In 1933 the Company took advantage of the facilities afforded by the Gas Undertakings Act of 1932 and acquired control of the Hitchin and District Gas Company and the Stevenage Gas and Coke Company, Ltd.

Welfare of Employees.

The Company has always been interested in the welfare of its workpeople, and in 1908, under the Chairmanship of the late Sir Corbet Woodall, a scheme of co-partnership was put into operation. This scheme applies to the regular employees of the Company, who become stockholders in the Company and share in its prosperity by receiving not only dividends on their stockholdings but also bonuses on their wages based on the dividends paid to stockholders. It is interesting to note that co-partners in one way or another have since the inception of the co-partnership scheme received from or invested in the Company the sum of approximately £275,000.

In 1914 a pension scheme was instituted. This scheme is contributory, the employee and the Company each contributing a like amount. It is designed to provide an adequate pension for an employee on retirement at the age of sixtv-five. Seventy-five pensioners are now benefiting by this scheme. In 1929 a welfare scheme open to co-partners was inaugurated, which provides for payments additional to those received under the National Health Insurance Acts when employees are absent through sickness. In 1931 a home purchase scheme was set up which assists co-partners to purchase their own houses. In 1933 arrangements were made, in conjunction with the Society of Friends, to hand over to local unemployed thirteen acres of land for allotments. At the present time this land is being cultivated by eighty-five men.

One of the most active departments of the Company is the Social and Athletic Club. The present club premises were erected by the Company as a War Memorial and formally opened in 1924. The entrance to these premises, which is constructed of Portland stone and contains bronze tablets commemorating the names of those employees who fell during the war, was provided by employees of the Company. The club premises are situated in Willoughby Lane, Tottenham, in a recreation ground which provides facilities for cricket, football, bowls, and lawn tennis. The ground also contains a well equipped rifle range.

Expansion.

The demands for gas were such that for several years prior to 1914 the output of the Company was increased by 100% every eight or ten years. The Company has always been progressive and was one of the earliest undertakings to install carburetted water gas plant and continuous vertical retorts.

While each new carbonizing plant which has been installed has been more economical in the employment of labour than preceding plants, at the same time the growth of the Company has been such that even when it may have been necessary to displace labour on the works, at least an additional equivalent amount of labour has been employed in the distribution department.

Gas is now made at Willoughby Lane Works, Tottenham, Ponders End Works, Enfield, Hertford, Hitchin, and Stevenage.

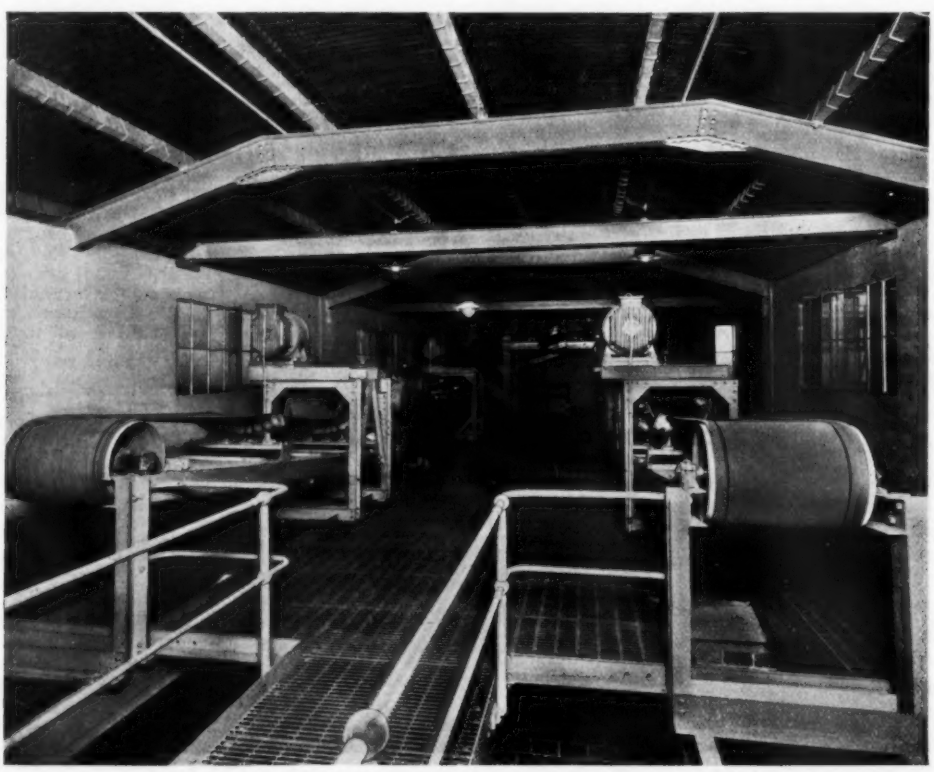
Until recently the carbonizing plant at Willoughby Lane Works consisted of two horizontal retort houses, a continuous vertical retort house and carburetted water gas plant.

In 1932 it became obvious that within another year or two very extensive repairs would be necessary in the two horizontal retort houses. In addition to the repairs required in the houses, the coke grading plants were out of date and inadequate. In view of the repairs required to the carbonizing plants and of the increased importance of coke as a domestic and industrial smokeless fuel, the Directors decided to put in an entirely new carbonizing installation, together with an adequate coke-grading plant.

After full consideration it was decided that the carbonizing plant should take the form of intermittent vertical chambers, one of the main advantages of this type of plant being that it gives the widest possible range of choice of coals. The plant has been erected by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.

An interesting point in connection with the coke grading plant is that it is so designed that all coke which will pass through a 1¾ in. screen is removed by a primary screen and conveyed to the retort house, where it is re-screened into sizes suitable for boiler fuel, as coke pads for the bottom of the coal charges, and for producer fuel. The coke which passes over the 1¾ in. screen and which contains the smallest percentage of ash and moisture is cut and graded for sale for domestic and industrial purposes.

The majority of the mechanical operations in connection



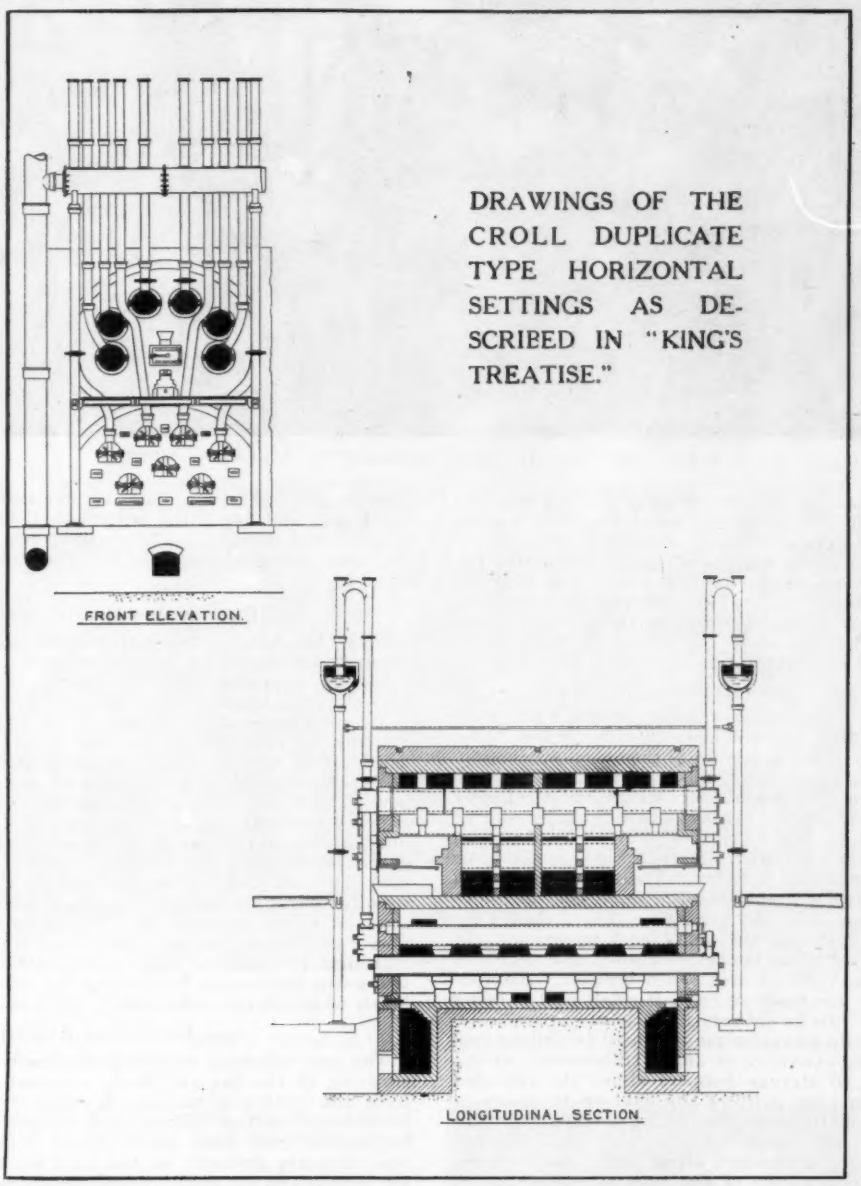
GENERAL VIEW OF PRIMARY SCREENING PLANT.

Showing the C.C.L. Grading Screens and Belt Feeders.

with the new carbonizing plant are controlled by electricity. Electricity is generated on the works by means of duplicate Lancashire Dynamo Company's 200 KW. generators driven by Belliss & Morcom engines. These generators are installed in a new power house, room being left for exhausters which will be required at a later date. The steam required by these generators is raised in waste-heat boilers, the waste gases after leaving the retort settings passing through the boilers before entering the chimney.

The gas from the ovens is cooled by two super type horizontal tube water-cooled condensers manufactured by Messrs. W. C. Holmes & Co., Ltd.

After passing through the condensers, tar is removed by a W. W-D electro-detarrer, and thence passes through the existing exhausters, scrubbing and purifying plant, which



DRAWINGS OF THE CROLL DUPLICATE TYPE HORIZONTAL SETTINGS AS DESCRIBED IN "KING'S TREATISE."

previously dealt with the gas made in the two horizontal retort houses now displaced.

THE NEW INTERMITTENT VERTICAL CHAMBERS.

The new installation comprises two benches each containing four settings of intermittent vertical chambers. Each setting contains six chambers, a producer, recuperator, and waste gas flue. There are thus forty-eight chambers in all. A party wall and straight joint is provided between each setting and its neighbours, so that the settings are entirely independent of one another. The installation is provided with a complete coal and coke handling plant and two waste heat boilers are installed.

The chambers are rectangular in plan and are about 21½ ft. high, 10 ft. long, and 1 ft. wide at the bottom. The width tapers evenly from bottom to top to ensure unaided discharge of the coke when carbonization is completed. Each chamber has a capacity of approximately 3¾ tons of coal per charge. When making 550 B.Th.U. gas, the chambers are charged and discharged at intervals of about eleven hours. In these circumstances the plant has a maximum daily capacity of 392 tons of coal and will produce approximately 5,200,000 c.ft. of gas. In normal working with allowance for scurfing the capacity of the plant is 373 tons of coal and 4,800,000 c.ft. of gas a day.

The chamber walls and heating flues are constructed in silica and are finished at the top and bottom with a series of fireclay blocks.

Suitable provision is made for steaming the charge, an operation which is carried out during the last hour or so of the carbonizing cycle.

The producer and recuperator are built into the setting and rise from the ground floor level to the full height of the setting. The recuperator, through which air and hot waste gases pass in counterflow, is built in two halves, one on each side of the producer. The producers are fitted with step grates.

Combustion of the producer gas takes place in horizontal flues, facilities being provided for the admission of secondary air at various levels as required. Temperature is even from end to end of the flues. The flue temperatures are lower at the tops of the chambers than the bottom, but the decrease in the minor axis from bottom to top acts as a counterbalancing factor, and the charge is carbonized equally throughout its full height. Facilities are provided

GENERAL VIEW OF THE NEW INSTALLATION TAKEN AT NIGHT.

for partially by-passing the recuperator and raising the temperature of the waste gases, when required for increasing the steam output of the waste heat boiler.

A special feature of the bracing of the setting is the use of water-cooled tie rods through which softened water flows to the waste-heat boiler feed. These tie rods contribute to the efficient support of the chamber by the buckstays and the bracing and thus maintain the brickwork tight under varying conditions of working.

Coal and Coke Supply.

Coal is brought in railway wagons on the Company's sidings and is weighed on a track weighbridge before being tipped by means of a wagon tippler of the automatic clamping type into a steel coal receiving hopper placed beneath the level of the track. This hopper, which has a capacity of twenty tons of coal, is provided with adjustable sliding doors for regulating the supply of coal to two jigging feeders, one under each outlet. Each jigging feeder feeds coal into a single-roll coal breaker. The feeders are fitted with screening bars for by-passing the small coal direct to the delivery chutes below the breakers. These chutes deliver the broken coal and the small coal by-passing the breakers into two cased-in bucket elevators, one of which is arranged to take delivery from each breaker. Alternative arrangements are made so that, if small coal is being used, the breakers can be entirely by-passed.

Either of these two elevators may be used to deliver coal to a reversible band conveyor arranged transversely at one end of the overhead storage hoppers above the chamber benches. This conveyor delivers the coal on to either of two push plate conveyors, one being arranged longitudinally above each range of overhead coal storage hoppers. The coal is discharged direct into these hoppers, which have a total capacity of 900 tons of coal or about fifty-five hours' supply to the whole installation. The coal is discharged through chutes into chamber charging cars, one of which is provided for each bench.

At one end of the overhead coal storage hoppers above each bench are situated the hoppers for separate storage of coke for the chamber pads and the producers. In order to obtain the correct size of coke for these purposes, the coke which passes through the scalping screens on the primary screening plant is brought by a belt conveyor to a secondary screening plant above the intermittent chamber plant. The oversize from the top deck of this screening plant is delivered to the producer coke hopper and that from the lower deck to the chamber coke hopper.

Each bench has an overhead monorail producer charging skip, which is automatically weighed as it travels to charge the producers. A chute from the producer coke storage hopper can be used for feeding coke to rail or road wagons. The chamber charging cars are electrically propelled and top hung, and are fitted with special chutes designed to secure rapid charging and even distribution and to prevent the coal being charged before the coke pad has been dropped.

Discharging the Chambers.

Each chamber is fitted at the bottom with a door which is opened and closed by hydraulic power. Two hydraulic rams are provided for each setting and operate a rack extending the length of the setting.

Two hot coke skips are provided, one for each bench, running on rails set in the floor beneath the chambers. They are of special design, of the bottom discharge type, and each is capable of holding the discharge from one chamber. The skips are hauled by means of electrically driven winches arranged at the extension end of the plant into quenching towers, one of which is situated at the end of each bench. After the coke is quenched, the skip is hauled into the yard and picked up from its chassis by an electrically driven transporter machine which discharges the coke on to an elevated coke wharf to cool. Two transporter rest houses are provided one of which houses a spare transporter machine. The coke wharf is fitted with control gates and chutes for feeding the coke into a twin skip hoist, which elevates the coke to the coke screening plant.

Gas Collecting System.

The gas collecting system is designed to ensure efficient spraying of the gas and ready removal of heavy deposits from the collecting mains. A noteworthy feature is the provision of bottom offtakes and collecting mains, designed to function only when gas evolution is exceptionally rapid and excessive pressure on the brickwork and ironwork at the bottoms of the chambers might otherwise occur.

Special attention has been paid to the recovery of waste heat from the combustion gases from the heating flues of the chambers. After passing through the recuperator and pre-heating the secondary air, they are taken out into a waste gas main, which consists of a circular steel casing lined with firebrick. One such main is provided for each bench. This main takes the gases either direct to a firebrick-lined steel chimney or to waste-heat boilers. Two such boilers are installed, of the horizontal fire-tube induced draught type designed for a working pressure of 120 lbs. per sq. in. They are of sufficient capacity to deal with the waste gases from the installation when it is extended to sixty chambers. Each boiler is provided with a turbine-driven waste gas fan at the outlet for delivering the waste gases to the chimney, and with a superheater at the inlet for raising the temperature of the steam generated in the boiler. The boiler feed water is preheated by means of a

feed water heater, which uses the exhaust steam from the fan turbines, and the water is fed to the boiler by means of steam driven water pumps. The feed water heater and one of the pumps serve both boilers, the other pump being a standby.

Coke Handling and Screening Plant.

A very comprehensive coke handling and screening plant has been installed to deal with the coke produced. By means of this plant coke can be screened to any size required.

As before mentioned, the coke after being quenched is allowed to cool on an elevated coke wharf and is discharged from this wharf by finger gates into a twin skip hoist. This skip hoist has a capacity of forty tons per hour, and discharges the coke into buffer hoppers situated above a range of reinforced coke storage bunkers, which have been erected on the north side of the chamber installation. From these buffer hoppers the unbroken coke is fed to two cutting and screening units, each of twenty tons per hour capacity, arranged in parallel. Each unit comprises a C.C.L. scalping screen, a "Phœnix" coke cutter, and two C.C.L. grading screens. The scalping screen is fed by a slow-speed reciprocating feeder and the grading screens by belt feeders.

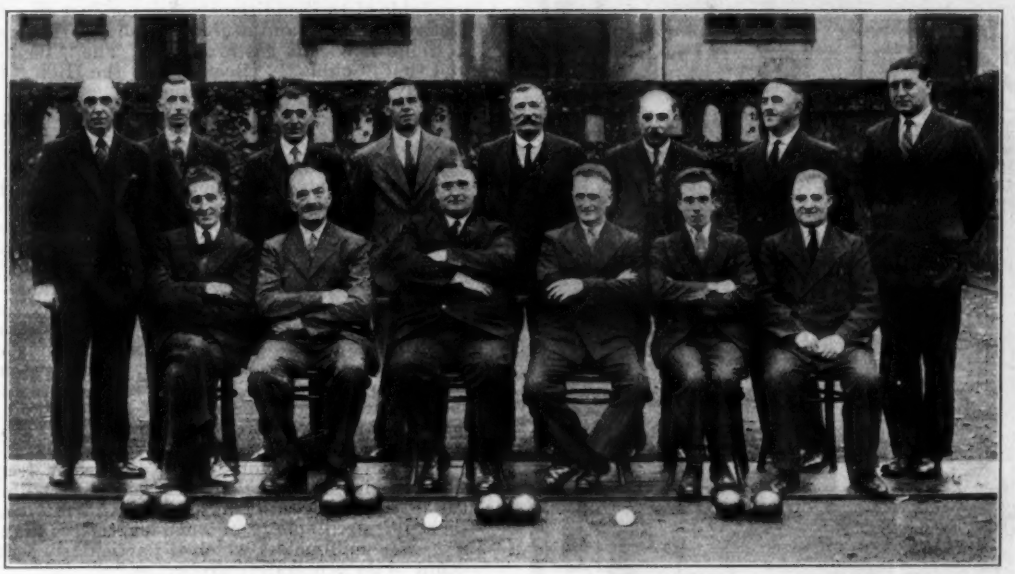
The coke passing the scalping screen is returned by a belt conveyor to the retort house, where it is graded by a secondary screening plant into the two coke-sizes suitable for the chamber pads and the producers, and into breeze which is used in the existing solid fuel fired boilers, which are fitted with chain grate stokers. The oversize from the scalping screens can either be stored as large coke, or can be passed through the cutter and then graded into broken coke, coke boiler nuts, and breeze.

Each of the four compartments of the coke storage bunkers is fitted with four outlets at the bottom, two on each side. The outlets on the north side are fitted with delivery chutes to railway wagons. Static screens and breeze hoppers are fitted to the delivery chutes on all except the breeze compartments. Thus the fine breeze is extracted from the coke before it is delivered into the wagons. All the outlets on the south side of the bunkers, with the exception of those on the breeze compartments, are fitted with a chute for feeding the coke into the weighing and bagging machine. These outlets are each fitted with a C.C.L. mechanical debreezing screen and hopper.

A very efficient system of lighting the plant at night by gas has been installed, and underneath the settings, where of necessity even the daylight conditions are dim, a very good working light has been obtained by means of gas floodlighting.

[An account of the opening ceremony will appear in our columns next week.—Ed. "G.J."]

Norwich Gas-Works Recreation and Social Club



The First team, reading from left to right:—Seated: F. H. Metcalf (Hon. Sec.), G. Lowe (Capt.), C. Rhodes Armitage (President), J. R. Goose (Vice-Capt.), G. E. Fisher, A. Shaw.

Standing: L. A. W. Barker, C. N. Martin, F. Willmot, D. Hadfield, G. French, G. J. Taylor (Chairman Social Club), W. A. Mallett (Vice-Chairman Social Club), A. Littlewood.

The Bowls Section of the Club have just held their Annual General Meeting, and so brought a very successful season to a close.

The Section ran three teams, and, in all, played 56 League games, 9 cup ties, and 8 friendlies, winning 32 League, 7 cup ties, and 6 friendly games. The first team were winners of the Norwich City League, the Inter-Gas Companies' Tournament (Cambridge, Ipswich, Norwich, and Yarmouth), and the Romany Rye "Jenny Lind" Hospital Cup. One block from the first team reached the final of the Norwich Bowling Association Blocks' Championship, and another block were finalists in the Tyler Charity Competition.

Members of this team were selected to represent Norfolk in county matches (two being holders of County Badges) and the Norwich Bowling Association in Inter-League games.

The reserve team reached the divisional final of the Norfolk County Cup Competition, Division II., and the third team put up a good show at their first attempt in the Norwich Business Houses League.

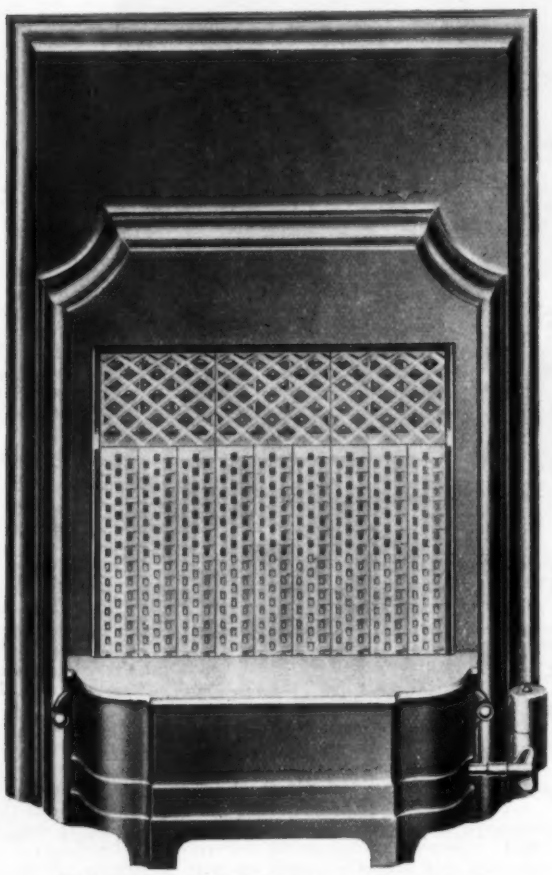
Norwich City League Cup. Inter Gas Companies' Trophy. Romany Rye "Jenny Lind" Hospital Cup. Cup and Replicas.

A New Gas Fire

Another Sales Aid for the Industry

As a result of continued research work, Radiation Ltd. have made a still further advance in gas fire technique. They are introducing the High " Beam "—the logical outcome of previous work on two widely-differing types of gas fire, the " Beam " radiant fire and the " Cobble " " Beam " fire.

The " Beam " radiant is the result of progressive development in radiant design, from the original columnar " Thermo " radiant (1908) to the " Thermo-X " (1910) and the " Thermo-XX " (1920). The conception of improvement in the quality of the radiant energy emitted by gas fires is due to Radiation Ltd., and the production of the " Beam " radiant in 1928 is still fresh in the mind of the Industry. Three years later the " Cobble " " Beam " gas fire was introduced. In this fire the radiating medium is a combustion chamber, the front wall of which consists of perforated plaques.



ONE PATTERN OF THE HIGH "BEAM" FIRE.

High Radiant Efficiency.

In the High " Beam " fire, which we have had the opportunity of inspecting, the intrinsic properties of both " Beam " radiant and the " Cobble " " Beam " plaque have been combined. This new fire has a radiating medium comprising two distinct entities: Columnar plaque radiants which become uniformly heated to a high temperature giving an exceptionally pleasing appearance and emitting energy rich in short infra-red rays, and curved upper or " Scrubber " plaques which abstract from the combustion products a further measure of heat thus combining to give to the High " Beam " gas fire *a very high radiant efficiency*. Where the ordinary type of gas fire requires 4 c.ft. of gas (calorific value 500 B.Th.U.) to heat each columnar radiant, the High " Beam " requires only 3½ c.ft.

The effect of the fire when alight is most pleasing; the columnar radiants are heated right to the top and the " scrubber " radiants above them also glow. There is therefore no " dead " space above the radiants. The absence of the usual projecting canopy gives to the High " Beam " fire a distinctive and charming appearance, and the new designs which thus become possible mark a definite and pleasing departure from accepted practice.

A number of years ago Radiation Ltd. envisaged the possibility of an improvement in the quality of the warmth from gas fires, and undertook a scientific investigation of the factors which determine the sensations of the human body when exposed to energy emitted by various radiant heaters. As a result of their work, knowledge was made available of the conditions which conduce to a feeling of increased comfort, and a great step forward became possible in the principles of gas fire design. The " Beam " radiants, and the " Cobble " " Beam " and the High " Beam " fires embody the knowledge so gained.

Short Infra-red Energy.

The High " Beam " emits the valuable short infra-red energy which has the property of penetrating the epidermis (cuticle), reaching the derma (true skin), and stimulating the bloodflow in the capillaries. This stimulation of the bloodflow is beneficial, and is a useful palliative in cases of rheumatism, neuritis, &c.

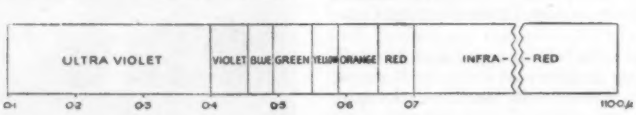
In addition, short infra-red energy produces a sensation of greater comfort than is the case with energy of the longer infra-red type. Thus the warmth from the Radiation High " Beam " fire, on account of the short infra-red rays emitted, is soft, comforting, and of stimulative value to health. This effect has been attained together with an increase in radiant efficiency so that without any loss in heating capacity a considerable saving in gas consumption is effected.

The wave-lengths of energy of various frequencies are shown above, the range of the visible spectrum and that of the infra-red region being indicated in the diagram. It is short infra-red energy of wave-length less than 3 μ (where $\mu = \frac{1}{1000}$ millimetre) which is particularly valuable on account of its penetrative properties.

Self-Lighting Gas Tap.

The High " Beam " fire is supplied complete with the Radiation self-lighting gas tap which does away with the need to use a match or taper to light the fire. It is only necessary to turn on the gas by means of this tap and the fire lights up automatically. The added convenience resulting from the incorporation of this new feature will prove a strong selling point.

The self-lighting gas tap has been exhaustively tested and is certain in operation. The small battery supplied with the tap will give service for a long period. When required, a new battery can be easily fitted by any user at a cost of only a few pence. The tap can, of course, be used in the same way as an ordinary gas fire tap at any time.



The line of demarcation between the different portions of the visible spectrum is not sharply defined, but the extent of each section is indicated in the above diagram.

New Process of Tar Treatment

Dehydration and Distillation Plant at Wellingborough

In view of the present interest in road tars of all descriptions and the desirability of producing different grades to satisfy numerous specifications for different undertakings, the Chemical Engineering & Wilton's Patent Furnace Company, Ltd., have developed, after numerous installations with constant research work, a continuous tar distillation plant having the following characteristics:

1. Constructed entirely of cast iron, to resist corrosion from ammonium chloride and tar acids.
2. Fool-proof in that unskilled labour can be trained to operate it without damage.
3. Economical in both fuel and capital costs, as far as cost of production of distillates is concerned.
4. Elimination of costs of renewals, and self-operation of the plant.
5. Elimination of any tendency of pipe stills to carbonize after a period of working.
6. Removal of any quantity of volatile from a given bulk of tar without difficulty.

New Tar Distillation Plant.

The first plant has been installed at the works of the Wellingborough Gas Light Company, with the kind permission of the Directors; and thanks to the Engineer, Mr. C. C. Wood, we are able to-day to publish particulars of its efficient working and the results of tests.

Distillation has been effected at varying temperatures, and Nos. 1, 2, and 3 Road Board Specification Tars have been produced and also hard pitch of the highest quality. The plant has been working for some months most efficiently. Fig. 1 shows a flow diagram, and fig. 2 is a photograph of the installation at Wellingborough.

Operation of the Plant.

The plant operates as follows: The crude tar feed tank T supplies the crude tar to the plant. The tar passes through an economizer S and from there to the thermostatic valve W. The pump A circulates mixed products at the bottom of the column represented by the area from V vapour box to L mixer through the coil still B out at the valve C into the vapour box V. From this point the gases pass over from the top of the vapour box V into the condenser M. The liquids in the vapour box V pass in two directions, through the by-pass pipe at F and through the other by-pass pipe G. The purpose of the stream of liquids through by-pass pipe F is to mix with the incoming tar at W, where the two streams are mixed and take a zigzag course over horizontal trays down the column E. Thus the column is divided by means of a division plant at D, and any vapours given off by the admixture of hot and cold tars in the column are turned into pipe N and from there into the condenser O, the thermostat at R being set to control the temperature of the whole system at any desired point. The control is operated by opening and shutting the valve W and admitting cold tar into the system through the economizer at any given stream and quantity according to the rate of firing of the still. In this way, water and light oils are liberated in the column E through the vapour pipe N to the condenser O. The mixed dehydrated tar and crude tar partially dehydrated in the mixer L passes through the pump A to the coil still B, and the temperature is raised to such a point that, when the mixture is admitted to the vapour box V the addition of steam at point D will complete the distillation of the tar, and hard pitch will be discharged through the economizer S to the outlet point at U.

It is important to observe that, owing to the special arrangements of the pipe G, only finished products can overflow at U. The overflow of the finished product depends upon the level of the liquid in the mixer L. Provided the valve G has been set to give the maximum duty of the plant in throughput, then the product overflowing at U must be the finished product. Any surplus travels back again to the mixer L.

A Self-Operating Unit.

The plant as it is arranged is self-operating. The thermostat arranged as shown admitting the crude tar according to the temperatures at which the plant is to be worked does not permit of excessive temperatures. Should the temperature fall below the distilling point, no discharge at U of the finished product would take place. Thus, with a gas fired still the plant is self-operating; and with a hand fired furnace the plant is self-operating and foolproof, provided the operator fires the still at reasonable intervals.

The pump A is circulating through the coil still, the

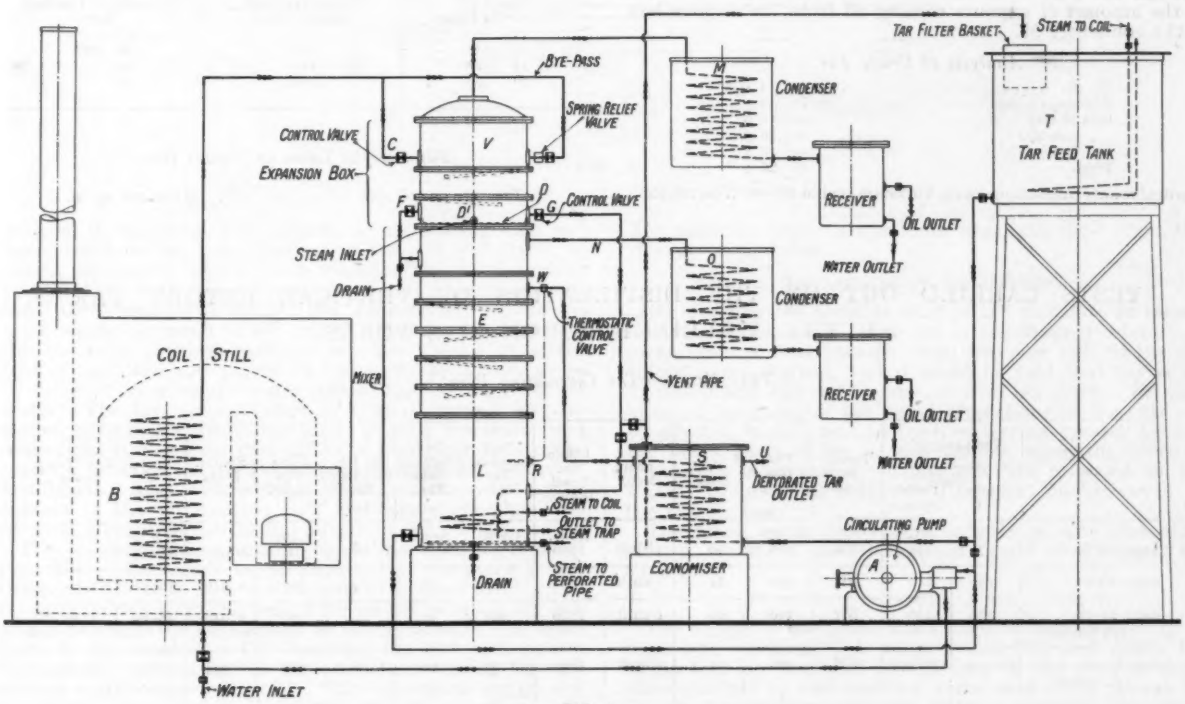


FIG. 1.

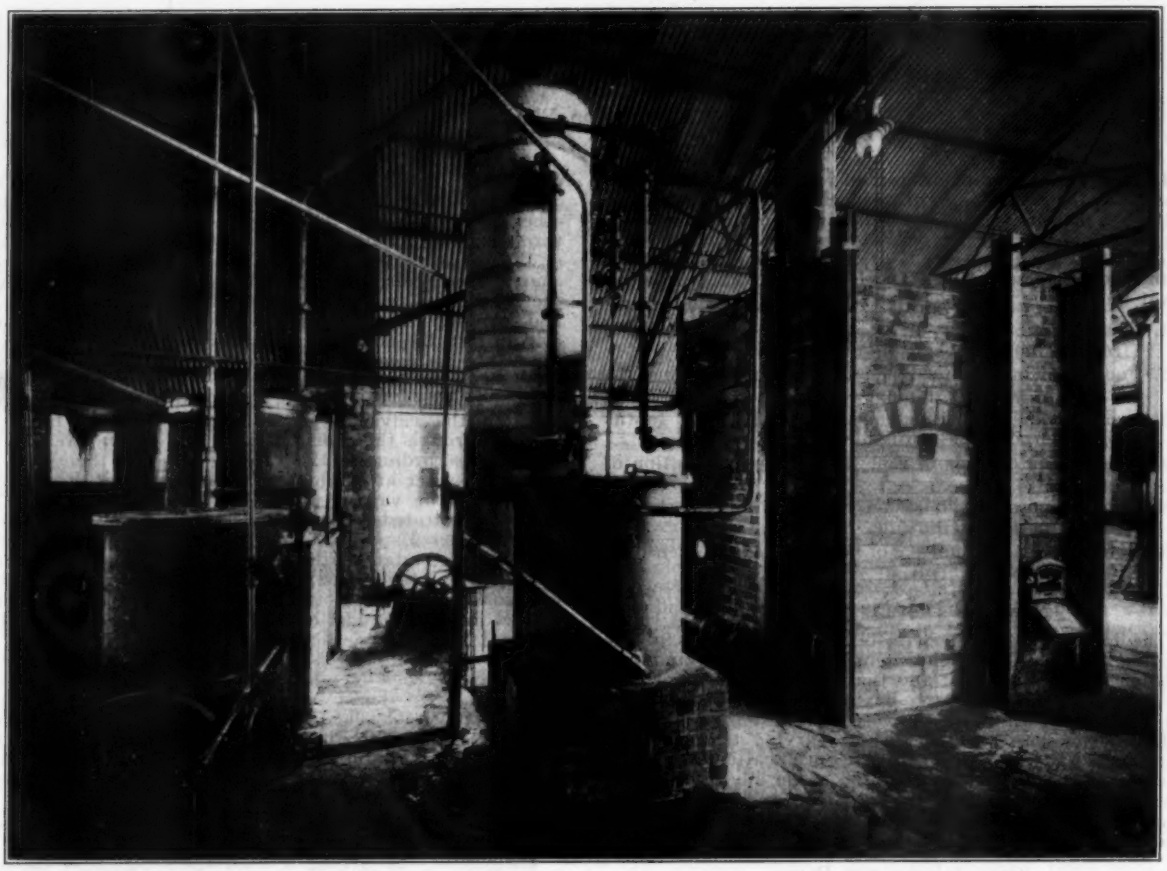


FIG. 2.

vapour box, the mixer, and back again in a closed circuit, and the tar to be treated is admitted in regulated quantities by the thermostat. The outlet or discharge of the plant will depend upon the level and the quantity finished in the mixer L. The faster the pump A is worked the greater will be the quantity of distillates coming over through the pipe N to the condenser O, and the less will be the amount of vapours coming off from the vapour box to the condenser M.

Analysis of Crude Tar.

Sp. gr.		1·085
Water	up to	3 %
Oils to 200	=	2·9 ,,
,, 200–270	=	19·9 ,,
,, 270–300	=	8·1 ,,
Pitch	=	66·1 ,,

(Vertical retorts carbonizing South Yorkshire coal in Glover-West retorts).

TEST NO. 2.

Effect of Speed of Pump on Throughput of Plant.

Coil temperature = 270° C. Mixer = 240° C.

Speed of Circulating Pump.	Crude Tar Used. (Galls./Hour.)	Viscosity of Finished Tar.
28 r.p.m.	63	96 secs.
34 ,,	110	90 ,,
50 ,,	130	75 ,,

Tar Samples Taken on Vapour Box.

Pressure on coil still . . . . . 25 lbs. per sq. in.

TESTS CARRIED OUT ON THE DISTILLATION OF VERTICAL RETORT TAR AT THE WELLINGBOROUGH GAS-WORKS.

TEST NO. 1.—*Tar Circulating Plant.*

Date. 1933.	Temperatures.		Press. on Coil.	Flue Gas Temp.	Fuel Used.	Labour (Men).	Crude Tar Used. (Calc.).	Finished Tar Made.	Viscosity Finished Tar.	Sp. Gr. Finished Tar.	Light Oils Made.	Sp. Gr. Light Oils.	Speed of Pump.	Fuel/Ton Crude Tar.
	Outlet Coil.	Outlet Column.												
	°C.	°C.		°C.	Cwt.		Galls.	Galls.	Secs.		Galls.		R.P.M.	Cwt.
Sept. 19–20 . .	274	244	*Nil*	400	10	1/shift	1930	1390	45	1·180	500	0·954	28–33	1·04
Sept. 20–21 . .	270	240	*Nil*	350	11	1/shift	1280	900	45	1·140	350	0·940	30–33	1·7
Sept. 21–22 . . (17½ hours)	270	236	*Nil*	350	10	1/shift	1230	900	30	..	300	0·940	30–35	1·23
Average day's run (24 hours)	270–274	236–244	*Nil*	366	11·3	1/shift	1630	1173	40	1·16	383	0·944	30	1·32

TEST No. 3.

Distillation to Pitch.

Duration of test	4 hours
Crude tar	60 galls./hour
Coil still outlet temperature	320° C.
Mixer column outlet temperature	296° C.
Pitch made	Hard
Steam on vapour box	¼ turn
,, column still	Valve cracked

Oil Distillations.

Range.	Column Still.	Vapour Box.
Specific gravity	0·969	..
Water	1·83%	0·83%
–120° C.	3·16 ,,	2·0 ,,
120–180° C.	3·33 ,,	2·66 ,,
180–230° C.	51·00 ,,	30·33 ,,
230–280° C.	28·66 ,,	27·00 ,,
280–350° C.	9·0 ,,	21·33 ,,
Residue	3·0 ,,	5·85 ,,

It will be observed from Test Nos. 1 and 2, when carefully compared, that there is a distinct difference in the resulting viscosity of the tar by the difference in pressure maintained on the outlet valve of the coil still.

Test No. 3 shows the results of the plant working to pitch.

Where larger water contents are continuously found in the tar than have been found at Wellingborough, and it is desired to maintain the output, a pre-heating coil will be inserted in the same setting as the coil still itself, as shown in fig. 3, which is a modification of the plant as installed. It will be seen from this that the crude tar, after passing through the economizer, where its temperature is raised to 60° or 70° C. by interchange with the outgoing finished product, is then passed to a few laps of cast-iron coil placed in the waste-heat flue, so as to raise it to a temperature above the boiling-point of water. The tar is then taken to a small vapour box installed outside the crude tar tank, so that the water and some light oils are distilled off in a condenser before the product is admitted to the vapour column for complete distillation. This will only be necessary where the water content in the tar exceeds 10% and where complete distillation is required for the full output of the plant.

The accompanying diagram (fig. 3) indicates the general procedure. The crude tar is admitted at the point Z and the crude tar tank T is maintained at a fixed level. The tar is extracted from the tank T by means of pump D1 and passed through the economizer or pitch cooler E and from there to the condenser C3. Leaving the latter, it passes through the coil setting in the waste-heat setting P2 and returns to the vapour box V1. The vapours or steam are transferred by means of a pipe to the condenser C, and any light oils which come off separate and deliver to the naphthalene and benzole tank. This circulation is maintained as a closed circuit and any crude tar which is taken to the distillation column V2 is replaced by means of the float valve at Z. Thus the crude tar is admitted into the vapour column V2 at the point W with water practically eliminated. The pump D2 picks up tar which is charged into the column V2, passing it through the coil P1 and into the vapour box at the top of V2. The vapours travel to the condenser C3, the liquids from V2 passing down two pipes at S.

The pipe leading to the bottom of the column conveys sufficient finished pitch to be discharged through the economizer E. The surplus quantity of pitch in circulation travels down a smaller pipe at S and down a cascade column, coming into contact with the crude tar at W. The circulation in this case is maintained until the temperature at X rises to such a point that complete distillation to pitch is effected. Above this temperature a thermostat automatically admits crude tar at W and maintains its temperature sufficient for complete distillation. Thus, if the column V2 is divided right across at SS, anthracene can be steamed off from the vapour box V2 into the condenser C3.

The vapours which come off by the mixing of hot pitch with crude tar at W pass away to the reflux column C2, which is maintained at any desired temperature by a thermostat at Y2. The vapours passing from this column travel to the reflux column C1, where again the fractions are separated to any point by a thermostat at Y1. The final vapours from this column pass to the condenser C.

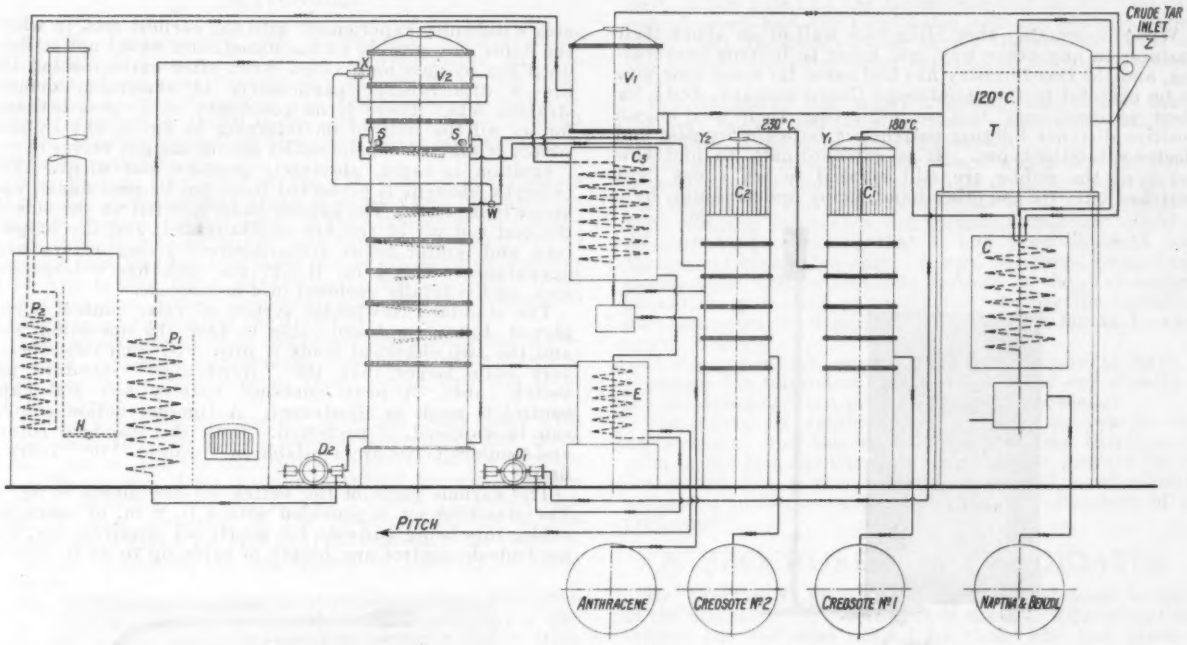


FIG. 3.

The products from each column pass into their respective storage tanks below.

ADVANTAGES OF THE SYSTEM.

By utilizing the sensible heat of the distillate to impart heat to the incoming crude tar in the manner adopted, a more efficient heat transfer from the pipe still to the distillate is maintained, and it could be said that tar is dehydrated and distilled by contact with hot pitch. By variation of the speed of the pump alterations in the cuts can be effected in dehydration by transferring greater heat to the lower parts of the vapour column when the speed of the pump is increased. Thus, oils are removed in the vapour column and higher boiling-point oils removed on the vapour box.

The plant being constructed entirely of cast iron, difficulties found in distillation with mild steel vessels are eliminated.

SAFETY.

The design of the plant lends itself to absolute safety in regard to working. A water connection and crude tar connection are provided at the base of the coil, so that, when starting up and shutting down, cold crude tar can be admitted and afterwards cold water. A steam connection is also provided at this point, and in the very remote event

of a broken joint in the coil still (not a serious matter, as there is only a very few gallons of tar contained in the coil at any given moment) steam or water can be substituted for the tar by turning on an ordinary valve, and the supply of tar to the heating coil cut right off.

Utilization of Waste Heat.

Where there are available flue gases in quantities exceeding a temperature of 600°-700° C. this heat can be used to work the plant, provided there is a fan to draw these gases through the plant and project them back again into the system. This necessitates the use of the pipe still with somewhat greater heating surface.

Bitumen Mixtures and Emulsions.

When bitumen mixtures or emulsions are required, the plant can be easily adapted for this purpose.

In the case of bitumen mixtures a bitumen melter can be installed in the brickwork setting of the coil still, so that the waste heat at from 400°-500° C. circulates around the melter and melts a sufficient quantity of bitumen for a continuous run throughout the day. A small flow indicator is inserted in the pipe leading from the melter, and the bitumen is carried to a point in the vapour column by gravity. Falling down cascade fashion in the vapour column it becomes mixed with the dehydrated tar on its way to the mixer bottom. The pump which is circulating the material five or six times around the circuit before discharge thoroughly mixes the tar and bitumen, and the discharge from the plant is an efficient bitumen mixture.

With regard to emulsions, it has been described how bitumen can be added; and this, of course, includes any other liquids. Emulsions can be provided, and, in fact, are partially provided, by the very working of the process. The scheme can be completed by the installation of a small mill in the circuit, either in the circuit with a pump or at the outlet point of the finished product.

Cracking.

When low-temperature tars or crude petroleum oil are treated and cracking is required, continuous cracking can be obtained by the application, through a special valve fitted at the inlet to the vapour column, of pressure to any degree required.

THIS SWITCHING AGE

Wizards, whether they cling to a wall or go about their business in any other way, are liable to become overbearing, and the Gas Industry has had cause for some time now to be grateful to the Horstmann Gear Company, Ltd., for their patience and skill in perfecting their well-known positive distance lighting switches of both the by-pass and electro-catalytic types. It is extraordinary to find how many of the public are still amazed to see a gas light switched on. On the other hand, many undertakings, by a

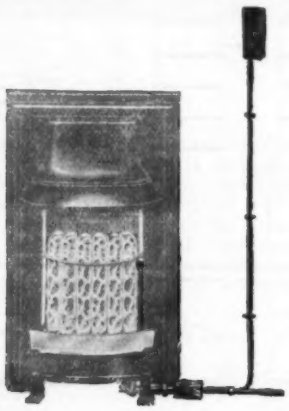


Fig. 1.

vigorous canvassing policy or otherwise, are installing switch-lighting sets by the thousand, on terms of all kinds to suit local conditions, and greatly to the advantage of their lighting loads.

Now Messrs. Hortsmann inform us that they are experiencing a heavy demand for the " Newbridge " gas fire switch, which is available after exhaustive tests, endless minor modifications, and long trial have convinced them that it is fully up to the standard which the Gas Industry expects of its appliances. We are not surprised at the demand. The Industry cannot ignore the modern fetish for convenience, whether it goes by the name of " wizardry " or anything else, and apart from such refinements of comfort as switching on the gas fire before getting out of bed, or even, we anticipate before long, lighting the bedroom fire from the foot of the stairs, the kindling process is associated in the minds of many people with fumbles for matches and taper, and of some with the startling bang which accompanied the operation in days gone by.

The Working of the Set.

The method of ignition is based on the electro-catalytic principle, but instead of lighting the fire direct the catalytic element kindles a by-pass, the flame of which is projected across two or three radiants. This by-pass flame is thermostatically controlled, and is reduced to a very small pilot flame after about half a minute. This by-pass weep obviates a difficulty experienced with the earliest sets, in which the flame was entirely extinguished, and would not re-light until the by-pass had cooled down after extinguishing the fire—a disadvantage particularly in showroom demonstration sets. There is no possibility of by-pass leakage, for as will be noticed on referring to fig. 2, the by-pass supply is taken from the outlet side of the gas valve.

Ignition is rapid, absolutely positive and silent. The catalytic element is protected from the by-pass flame, and keeps quite cool. The igniter head is fitted at the side of the end radiant of the fire as illustrated, and the by-pass tube and igniter heads are armoured, giving a very neat appearance. The ¼ in. B.S.P. gas cock has a large gas way, and is totally enclosed in a metal case.

The standard Newbridge system of valve control is employed, but a combined cable to take the operating wire and the two electrical leads is provided, such cable being very little larger than the " Newbridge " standard gas switch cable. A neat combined battery box and hand control is used, as illustrated. A tumbler action control can be supplied, if preferred. Both the standard rotary and tumbler types are available in " walnut " or " ivory " finish.

The various parts of the switch set are shown in fig. 2. The standard set is provided with 4 ft. 9 in. of operating cable, this being suitable for nearly all requirements, but for bedside control any length of cable up to 48 ft. can be

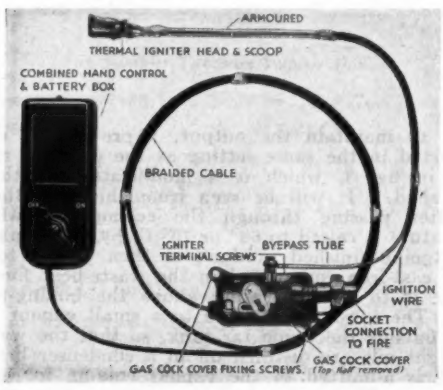


Fig. 2.

supplied. The set is delivered completely assembled, and it is a very simple matter to install on almost any type of gas fire. Full fitting instructions are included with each set.

The fire can, of course, be regulated to any required extent by means of the switch. The average life of a battery can be put at nine months, and the appropriate 3-volt size is obtainable either direct from the makers, or in several standard makes obtainable almost anywhere.

Education in the Gas Industry

Written Communications to the Discussion on the Tenth Report of the Gas Education Committee of the Institution of Gas Engineers.

Mr. R. J. RESTALL (Stalybridge): I beg to submit for the consideration of this Committee a point which seems to me of some importance.

In the case of a young man in the Gas Industry, who has reached the age of anywhere between 22 and 25 and has not yet obtained a First Class Certificate for the Higher Grade Examination, it becomes a very serious matter that he shall have to wait twelve months before being able to sit for the examination again.

A Candidate must obtain a First Class Certificate in the Higher Grade before he is able to take the Diploma Examination.

The Examiners may be able to devise a means of allowing those who have only obtained a Second Class Certificate to enter the same Examination again a few weeks after the set Examination. This would make it possible for the Candidate to prepare for the Diploma Examination approximately twelve months earlier than would otherwise have been the case.

IMPORTANCE OF JUNIOR TECHNICAL SCHOOLS.

Mr. W. CALDERWOOD, J.P. (Treasurer, Association of Technical Institutions): As a representative of this Association on your Consultative Committee, I am very interested in the Report of the Examiners, Appendix 6, where attention is drawn to the advantages which a sound general education gives to those who desire to specialize in Technical subjects.

The Report, like some of the City and Guilds Reports this year, indicates that there is much room for improvement in the general education of the Candidates for Certificates both Major and Minor, and therefore I would like to suggest that this improvement can be attained by the Gas Industry taking fuller advantage of the students turned out from the Junior Technical and Junior Commercial Schools in recruiting for the Industry.

The importance of these Schools is being continually emphasized, and most encouraging reports are being received from employers who receive their young entrants from these Schools.

At the Woolwich Polytechnic, of which I can speak with some authority, we have a scheme covering a full three years' course, and the curriculum embraces all the subjects your Examiners draw special attention to—viz., Mathematics, Drawing, Chemistry, and Physics. I would also like to draw attention to the recommendations of the Report on "Policy in Technical Education," the Authors of which emphasize the importance to Industry of these Schools.

May I therefore suggest to your Education Committee that attention should be drawn to the advantages the Industry would attain if recruitment were made from Junior Technical Schools, and that if possible the work should be further linked up after the students have entered the Industry, by attendance at part-time courses for apprentices?

THE SALES SIDE.

Mr. S. B. CHANDLER (Tottenham and District Gas Company): The Gas Education Committee is to be congratulated on its ability to present so excellent a report regarding the progress of the Scheme since its inception in 1924. Ten years represents a short period in the life of an organization of such magnitude and importance, and one which has far-reaching effect.

The Institution of Gas Engineers for some years previous to the formation of an Education Committee wisely foresaw the need for some more comprehensive system of technical education for those entering the Gas Industry, and realized quite rightly that future members of the gas profession would have to be in possession of considerable technical knowledge if the Industry was successfully to withstand competition and maintain its position as a great public service of national importance.

One cannot, of course, forget the very useful work done for the Industry by the City and Guilds of London Institute, particularly in Gas Fitting and Supply, and its co-operation with the Institution must have been very helpful.

A glance at Appendix 1, p. 8, of the Report, dealing with examination candidates, discloses the wide disparity between the number of external candidates in Gas Engineering—*i.e.*, 460—and those of the Gas Supply students, who number 251, a difference which might perhaps be a little difficult to explain.

Diploma awards in Gas Supply are also disappointing, there being six only compared with 93 awarded in respect of Gas Engineering. In view of the importance of Supply, Distribution, and Sale of Gas as affecting the prosperity of the Industry, it is to be sincerely hoped that a much larger number of students will qualify during the next year or two in order that this side of the Industry may not be found lagging behind.

The practical education and training of the Gas Supply students can be greatly facilitated by undertakings instituting schemes of apprentices on the Supply side which include practical training in all departments as part of the daily work, thus very considerably aiding the student and affording him an excellent opportunity of qualifying for a position in the undertaking as a result of his passing the examination.

One point in connection with the Higher-Grade Candidates in Gas Supply came to light in the recent examination. When taking certain Candidates through the oral part, it was noted by the Examiners that in only two cases out of seven had the Candidates had any district experience, their knowledge being purely theoretical. This was due to the Candidates being engaged on the manufacturing side.

It is suggested that where a Works Candidate is taking the Gas Supply examination some opportunity might be given him of obtaining this experience.

The granting of a certificate should imply that the holder is competent to undertake practical district work and control of fitters. Theoretical knowledge is all very well in its way, but the value of a Gas Supply Certificate might be affected were it known that it had been obtained upon theoretical knowledge only. It can, of course, be said that questions in written and oral portions of the examinations should be so framed as to disclose whether the Candidate has had practical experience, and this, so far as I understand, is done.

It does, however, seem rather unfortunate to have to "plough" a Candidate due to his lack of opportunity in the obtaining of the necessary practical knowledge.

The increasing number of entries year by year is very encouraging; the Scheme is already having excellent results in the Gas Industry, and a certificate granted by the Institution has a very definite value and is of material assistance in the advance of the younger members of the profession.

A BROCHURE FOR CANDIDATES.

Mr. WALTER T. DUNN (Hastings): I intended to speak in the discussion on the Report of the Gas Education Committee, but the time needed by those who had given in their names to do so was fully absorbed.

Sir Francis Goodenough, in his excellent résumé of the Report, touched upon the salient features which have marked the ten years since the Education Scheme was brought into being in 1923. Its development has been remarkable, as is evident from the circumstances that there were 36 internal students presented by four approved centres in the year 1924 as against 312 students by 26 approved centres in 1933.

Now, in the early years of any movement the work involved is always exacting. The indomitable spirit of Sir Francis had ample opportunity for exhibiting itself. As Chairman of the Committee from the date of its constitution Sir Francis has rendered invaluable service, while Mr. Walter Hole proved himself to be a loyal and efficient *aide-de-camp*. Mr. Creasey's interest and assistance are beyond praise. I write these observations from personal knowledge of the work of the Committee and its correlated bodies. Numerous difficulties, of course, arose, which are inevitable in the establishment and development of a scheme having so many ramifications as has the Gas Education Scheme.

The Examiners' reports given in Appendix 6 of the Committee's Report indicate generally that the requisite standard of work by the students has not been attained. With the object of arriving at a more satisfactory state of preparation I would suggest that the Committee add to their already heavy burden by providing a brochure containing hints to candidates, and a list of text-books recommended

for each subject. By this I do not mean to imply that the examiners' questions should necessarily be restricted to the problems dealt with in such books. It may be said that the publication of the questions set (see Appendix 5) should serve adequately to inform students of what is expected of them, but I still believe that a guide would be of great service.

In the discussion of the Report nothing transpired as to the value of the *vive voce* part of the examinations. It will be agreed that, say, fifteen minutes' talk with a candidate will rapidly disclose the extent and correctness of his knowledge in regard to the nature of the operations carried out in a gas-works, the instruments which are used for testing, &c.

REPLY OF SIR FRANCIS GOODENOUGH.

Sir FRANCIS GOODENOUGH, C.B.E. (Chairman, Gas Education Committee): As Chairman of the Gas Education Committee, I much appreciate the interest taken by Mr. W. Calderwood in the education work of the Institution. The matter mentioned in his contribution to the discussion is emphasized in Education Regulation 18, which suggests that the training provided by the Junior Technical Schools is a suitable preparation for the Major Courses in Gas Engineering and Gas Supply. Recommendations to Gas Undertakings as to methods of recruitment of employees—a very important subject, I agree—does not come within the scope of the Gas Education Committee.

In reply to Mr. Walter T. Dunn, I have to say that it is hoped that when the provisions of the 1933 Revision of the Education Regulations become more widely known and used, students will be able to ascertain clearly and without difficulty the most appropriate course of study. It is suggested that students would be well advised to secure guidance from their teachers in the selection of appropriate text-books.

The interesting point raised by Mr. S. B. Chandler concerning the practical education and training of Gas Supply students is one which is now receiving the careful consideration of the Gas Education Committee.

I would remind Mr. R. J. Restall that the Education Regulations do not allow students to sit for the Diploma Examinations of the Institution unless they are at least 25 years of age. If a student has not been able to secure a First Class Higher Grade Certificate in Gas Engineering by the time he has reached that age, he will require more than one year's work subsequent to the award of the Higher Grade Certificate, to prepare for the Diploma Examination, particularly having in mind that he has to submit an original Thesis, in addition to passing the written and oral portions of the Examination.

Combustion Products from Gas Appliances

33rd Report of the Joint Research Committee of the Institution of Gas Engineers.

Mr. JAMES W. WOOD in a written Reply to the Discussion at the Fifth Autumn Research Meeting states: Much of the discussion has centred upon the relative importance of the elimination of sulphur compounds from town gas, and of the methods to be adopted to combat their effects if allowed to remain. The advantages of sulphur removal were admirably stated by Mr. Masterman, and comprise reduced condensation, reduced corrosion, and greater comfort where flueless appliances are concerned. It would appear, therefore, that the ideal put forward by Dr. H. Hartley in the slogan "Sulphur Must Go," is unassailable.

The Joint Research Committee did, in fact, give most careful consideration to the position as regards the removal of sulphur from town gas, and it was evident that prospects of its *complete* removal at an early date were not at all bright, although benzole removal by oil washing or activated carbon would be accompanied by a lowering of sulphur content. If it is not practicable to attain the ideal of complete removal, it becomes necessary, as pointed out by Mr. Masterman, to determine the limit which is economically sound, bearing in mind the extent to which increased purification costs may be offset by savings in maintenance and replacement charges on the district. The prosecution of research into corrosion problems is therefore justified in circumstances as they exist to-day.

My remarks respecting the thermal efficiency of non-condensing water heaters have apparently been misunderstood by Dr. Hartley. There was no suggestion that they are necessarily inefficient, and it is pleasing to hear that modern non-condensing heaters can be produced with a thermal efficiency equal to, or even greater than, that of existing condensing types, this presumably being attained by reduction of wasteful excess air in the flue gases, attention to heat exchange, and to lagging. Such results, however, do not invalidate the statement that failure to condense involves a loss in attainable thermal efficiency proportional to the latent heat in the steam which is not condensed—a maximum loss of about 10% on the gross calorific value. In some of our own experiments we have condensed much more than one-seventh of the water produced by combustion. The explanation put forward by Dr. Hartley of the unpleasant odour sometimes emitted by cast-iron condensing stoves is probably correct, and his own remarks relative to corrosion make it questionable whether removal of sulphur compounds to any considerable extent as a corrosion product is at all a desirable thing.

The question raised by Mr. Firth relative to the discharge of products of combustion into false roofs is one that has frequently been debated. In the case he quotes the débris would have to be examined very carefully to ascertain whether the products of combustion had attacked the lime of the mortar, leading to general disintegration, or whether condensation on the under surface of the tiles had undercut the mortar and caused it to drop off bodily without attack of the general mass.

There is no reason for supposing that oxides of nitrogen in products of combustion do not act in the normal fashion in assisting the conversion of sulphurous into sulphuric acid. It must be remembered, however, that the reactions proceed comparatively slowly at the low concentrations found, and the products of combustion may have left the appliance before appreciable conversion has taken place. The suggestion respecting possible catalytic action of metals is of interest. A certain amount of work has been carried out upon the retention of sulphur acids by textile fabrics, and it is believed that in certain cases sulphuric acid can accumulate to a sufficient extent to cause rotting of the material.

Dr. Angus is to be thanked for calling attention to the work of Dennison upon corrosion by products of combustion. In the case of the copper fire-back boiler condensation does not play so important a part as in gas appliances, and one can readily see why an oxide film should not afford protection in this case, for it would be readily reduced by small amounts of CO or other unburned gases in the flue gases from a coal or coke fire. The experiences with a geyser constructed of 80/20 copper-nickel alloy are of special interest in view of the failure of the nickel to endow the material with greater resistance to corrosion. In the corrosion of iron almost all the sulphur except a little remaining as a basic sulphate may be removed from a corrosion deposit in the manner described by Dr. Angus.

The apparatus described in the Report for subjecting the external surfaces of tubes to the action of products of combustion is considerably more complex than the alternative type, and Mr. Howarth may be assured that many other considerations than those of cost were taken into account when deciding upon the type of apparatus to be used. The running of any considerable number of pieces of apparatus of the former type would be impracticable, although experiments with individual tubes might yield results of considerable interest.

The possibility of cracks developing, or of setting up differences in electrochemical condition by bending, or, indeed, by stress of any kind, is admitted, and compromise has been unavoidable in setting up the apparatus. Quite a number of the materials enumerated by Mr. Howarth have already been considered by the Committee, and some of them will be investigated as time and circumstances permit. We have no information as to the form in which sulphur compounds appear when combustion is seriously incomplete. Much of the difficulty in dealing with products of combustion arises from the very small concentrations in which the deleterious constituents occur. The suggestions put forward by Mr. Gair of utilizing nephelometric methods will therefore be carefully examined.

The possibility of ammonia going forward with the gas and being burned to oxides of nitrogen was suggested to me by D. Bertelsmann in 1929, and if the amount of ammonia going forward in general is as high as that quoted by Mr. Clayton, then the matter is worth experimental investigation. The ammonia in the gas used in our experiments was less than 0·2 gr. per 100 c.ft., but cyanogen and

hydrocyanic acid were not determined. The remarks made by Prof. Cobb will indicate to Mr. Townsend the steps that are being taken towards the investigation of trouble due to gum formation.

The information given by Mr. Butterfield as to the durability of parts of the Boys calorimeter when treated with a sprayed lead coating is of considerable value. It should be remembered that the parts protected are of very simple shape, and little difficulty should therefore be experienced in laying on a sound and homogeneous coating of considerable thickness. The experience with Staybrite steel is also of interest, since stainless steels are in general disappointing in their resistance to attack by sulphur acids. Mr. Butterfield is correct in attributing a greater production of oxides of nitrogen to luminous than to non-luminous flames. The differences are, however, not striking, and it is questionable whether the use of one or the other would materially change the rate of corrosion by the sulphur acids in the products of combustion from gases of normal sulphur content.

NOTES ON PLANT AND PROCESSES

The Etherium Feed-Water Treatment.

Water from natural sources invariably contains some mineral matter in solution or suspension. The major portion of this mineral content consists usually of certain calcium and magnesium salts that are only sparingly soluble. In consequence of their slight solubility, precipitation of these substances takes place continuously on evaporation of the water in a steam-raising boiler, giving rise to scale formation on the internal surfaces.

While the object of chemical pre-treatment of feed-water is to remove scale-forming matter from the water before it enters the boiler, an alternative method is to treat the feed in such a way that the scale-forming particles will not form a hard agglomerate when they are precipitated out of solution. The method of treatment of Messrs. Etherium, Ltd., of Terminal House, Grosvenor Gardens, S.W. 1—as outlined in an interesting brochure published by the firm—is a process of this nature, which, by affecting the state of aggregation of the deposits thrown down in a boiler, both overcomes their tendency to formation of large crystalline masses and also prevents their adherence to metallic surfaces. In this manner the deposits are rendered easily removable and virtually self-clearing, so that instead of adhering to the plates and tubes they readily pass away into the mud drum or bottom of the boiler. They are also eliminated more freely in the process of blowing down. By virtue of an alteration in the electrostatic forces brought into play between them, the particles are rendered less cohesive. There is no longer any hard scale to be removed by chipping.

The etherium process has the advantage of extreme simplicity, involving neither the use of chemicals nor, in general, the need for any additional plant. The water is treated in the feed tank, wherein certain elements are placed, and beyond the renewal of these at regular intervals no other attention is required.

The elements are hermetically sealed cylinders, called activators, filled with a special product containing etherium. They are suspended by insulated wires and attachments in the tank, which must be of suitable dimensions in relation to the quantity of water being treated.

The alterations to the normal physical characteristics of the mineral deposit are caused by a very absorbable radiation emitted by the etherium activators. This radiation imparts a particular form of molecular energy to the water, producing a state of activation of the molecules or molecular aggregates. There is a transference of this energy from the water to the scale, causing changes in the surface electrical condition of the scale particles, the effect of which is to lessen or destroy the normal cohesion both between the particles themselves and between the particles and the metal surfaces of the boiler. There is no deleterious action of any kind on the metal, which exhibits under the treatment a clean smooth surface without any tendency to corrosion.

Cellactite "Medway" Ventilators.

Efficient ventilation is being accorded its proper place as an important point in constructional design. For whatever purpose a building is to be used, ventilation is a factor of efficiency; and particularly is this so in buildings occupied by industrial undertakings, where workers' output can in many cases be related directly to the provision of healthy and comfortable conditions.

Apart from this, many processes call for controlled atmospheric conditions, or for ventilation to disperse steam or fumes, and this must be effective in all states of the weather, without draught or danger of water ingress.

The success of Cellactite incorrodible steel-cored corrugated sheets has created a natural demand for an efficient ventilator in uniform material, combining correct ventilation under all weather conditions with complete permanence. How the Cellactite "Medway" ventilator accomplishes this is described in an interesting brochure recently published by the makers, Cellactite & British Uralite, Ltd., of 296-302, High Holborn, W.C. 1, which production has been prepared as part of the firm's service to all those having roofing and ventilation before them. Not only is the ventilator itself fully described and dimensioned in all types, but its behaviour and capabilities over a wide range of atmospheric conditions are set out for the reader's guidance.

Briefly the salient features of the "Medway" ventilator comprise: A weathering cone; an outer shell protecting the interior from wind pressure; an arrangement of louvre faces, ensuring unhampered performance and checking entry of adverse pressure; a deflection ring which compels the main pressure from the roof slope to pass up outside the shell, except for a fractional admission which is allowed to pass up inside in the louvre channels, clear of the shaft, so contributing to the pull in the ventilator. The ventilator has a splayed base, the area at the bottom of which is considerably more than in the throat of the vent, to maintain the airflow unchecked. The special vane construction restricts any slight pressure entering in exceptional conditions to 25% of the shaft area only. The design of the vane also affords increased strength and rigidity.

In short, the "Medway" ventilator is an efficient roof vent designed (*a*) to keep out weather and down-blow, and (*b*) not merely to offer minimum obstruction to the natural flow of warm air, but actually to induce upward pull.

The "Wollaston" Producer Furnace.

In connection with the recent acquisition of the manufacturing rights for the "Wollaston" patent producer furnace by Messrs. R. & J. Dempster, Ltd., of Manchester, the firm have published a brochure in which they set out the various advantages of the furnace, which they claim are being substantiated by the results obtained at Messrs. Edward Barlow's mill, near Manchester.

This brochure contains a description—taken from *The Engineer*—of the "Wollaston" producer gas furnace fitted to a Lancashire steam boiler at the works just referred to; and it is stated that, although a considerable amount of experimental work had previously been done in the application of the Wollaston patents to horizontal steam generators, this may be considered the first permanent installation, and the results obtained, after regular use for some time, have been very gratifying.

The furnace is a development of the Siemens principle provided with a water sealed mouth at the bottom for the removal of ashes. The fuel—in this instance coke breeze—is fed into the producer by means of two charging hoppers, and forms a deep bed which is partly supported on the inclined grate and refractory wall. The lower ends of these parts terminate in an opening through which the residual ash passes into the water in the ashpit. The whole furnace is carried on runners, which enable it to be removed away from the boiler when necessary, and to facilitate this movement a pivoted flap door is provided to support the ash temporarily until the producer is moved again into its working position. Two water chambers are provided across the whole width of the furnace, and are interconnected by the circulation pipes at each end.

The upper L-shaped chamber forms the roof of the furnace, and the water therein is automatically maintained at a fixed level by means of a feed regulator, thus provid-

ing a steam space. Low-pressure steam, at a blow-off pressure of 5 lbs. per sq. in., is generated in these two chambers, and is used to saturate the primary air supply to the space below the grate. For this purpose a fan is provided. It has a main regulating damper, which controls the total air supply. The air passes into the back chamber and finds its way to the space below the grate. A portion of the air controlled by rotary valves is tapped off and used as secondary air to the two burners. Levers are provided for controlling the burners independently.

As in normal producer practice the primary air is restricted so that the carbon in the fuel is partially burnt to carbon monoxide, any carbon dioxide formed being reduced to carbon monoxide in passing through the fuel bed. The steam supplied by the low-pressure boiler is added to the air to reduce the temperature and prevent fusing of the ash. Some of the steam, in conjunction with the incandescent fuel, is split up, giving hydrogen and carbon monoxide.

The gas passes through the central outlet and divides into two streams, one to each burner. These burners are provided with a series of air ports, which supply the secondary air. The gas, when ignited, forms a large flame of the bunsen type, which impinges upon the perforated refractory brickwork walls built within the boiler flues, and cause them to become incandescent.

The fuel, consisting mainly of Rochdale gas-works coke breeze, was fed to the producer furnace by hand through the two hoppers, involving no skill whatever. Ash was drawn through the water lute once every twenty-four hours, a poker only being used.

The owners of the mill state that before fitting the producer furnace the average weekly coal consumption was 14 tons, costing 22s. per ton = £15 8s., whereas, after fitting the producer furnace the average weekly consumption of coke breeze works out at 12 tons, costing 13s. per ton, or £7 16s. per week. The average fuel cost per 1000 lbs. of steam generated from and at 212° F. works out at almost exactly 9d.

The grate is of the stationary type, which is satisfactory when coke, good breeze, or non-coking coal is used; but for poor breeze or coal with high ash of low fusibility a mechanical grate, worked either continuously by power or at intervals by hand, is recommended. This producer has the advantage of assisting smoke abatement in which the Gas Industry is naturally interested.

New Delavaud Spun-Iron Pipe.

The Stanton Ironworks Company, Ltd., near Nottingham, have now placed on the market a new 3 in. diameter spun-iron pipe manufactured by the well-known Delavaud process.

This pipe, which is 12 ft. long and will be tested hydraulically to 200 lbs. per sq. in., conforms to the British Standard Specification, with the exception that it is ¼ in. thick and weighs 1 cwt. The prominent feature is the greatly reduced price of 2s. 1½d. per yard f.o.t. makers' works.

This pipe is not intended to take the place of the present heavier 3 in. diameter spun-iron pipe, but is being introduced in order to meet the demands of those who prefer cast-iron pipes to those of other materials.

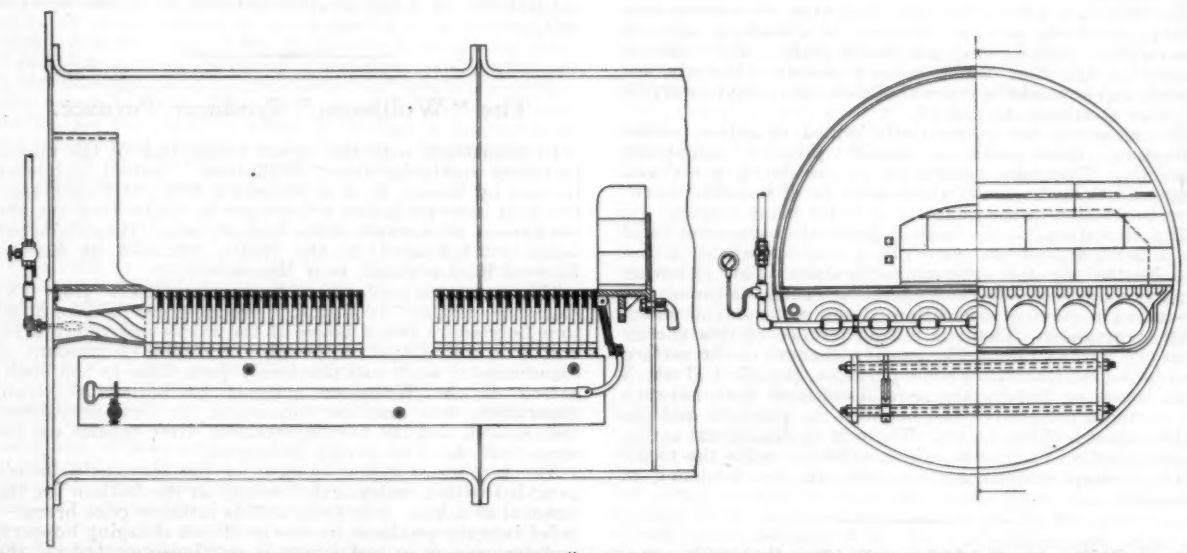
Radial Air Screw Furnace.

A three weeks' test at the Bolton Corporation's Lum Street Gas-Works, on a new type of furnace, has proved highly successful. The furnace, illustrated diagrammatically here, is made by the Radial Smoke Burner and Engineering Company, Salop Street, Bolton, and is particularly suitable for burning coke and coke breeze.

In this furnace a notable advance is made by the introduction of the air screw in the venturi trumpets. By this method the air is given a rotary motion in an anti-clockwise direction, while passages through the firebars are so designed to form a spiral groove following a clockwise course. Thus resistance occurs evenly throughout the length of the grate, the metallic formation being in opposition to the air screw from the first furnace bar onwards, ensuring equal combustion over the whole grate area.

A further feature is the improved method of removing ash deposits from the air tubes passing longitudinally through the firebars. A hinged damper is provided at the rear of the furnace, which effectively seals the air passages during steaming periods and is controlled by lever and ratchet gear at the boiler front. When this damper is opened fine ash and grit deposits are blown through the tubes by the force of the steam jets at the furnace fronts. The ash is baffled by the cast-iron half moon placed a few inches behind the damper, and subsequently falls to the bottom of the boiler tube, where it is easily and quickly removed in bulk. An innovation which will be appreciated by boiler attendants is the provision of extra space through the air passages in the form of a semi-circular channel into which the ash may collect, allowing much longer periods between cleaning, a decided advantage when boilers are being operated at or near their maximum capacity. For the removal of heavier solids not cleared by the steam jets, a special rake is provided, which may be inserted through the venturi trumpets, pushing the ash to the rear and thence through the cleaning damper.

The firebars are specially designed in order that coke breeze screenings may be used with the utmost efficiency. There are upwards of 2500 air spaces.



THE RADIAL PATENT AIR-SCREW FURNACE FITTED WITH "CARLING" ECONOMIC JETS AND PATENT QUICK ASHING GEAR.

Heating Horizontal Retort Settings*

By H. James Risby, Assoc.M.Inst.Gas E., South Metropolitan Gas Company.

Of the various processes introduced for the destructive distillation of coal, the principle of horizontal retorting continues to occupy an important position in this country, despite the rather remarkable coincidence that the methods employed for the heat treatment of this type of retort have, generally speaking, proved to be fundamentally wrong, giving as they do a serious lack of uniformity of heat treatment of the retorts and their coal charges, consequent upon the prevalent present-day features of heat distribution in the heating chambers of the said settings, a remedy for which it is intended this paper shall introduce.

LIMITING TEMPERATURE FACTORS.

The limits of refractoriness in practice have been considered approximately 1250° C. for firebricks with a margin of safety of 100° C.; for siliceous material 1300° C. also allowing 100° C. margin of safety; and for silica material 1450° C. with a margin of safety of 150° C. It is usually agreed that the margin of safety of any material should not be less than 100° C. in the interest of the life of the setting. It will usually be found that the hot coke leaves the retort at an average temperature of 900° C., therefore the temperature difference for heat conductivity in the case of firebrick is 1250 − 900 = 350° C., while in the case of silica material the difference is increased to 550° C., representing an increase of a further 200° C., or $\frac{200 \times 100}{350} =$ 57% in the amount of heat conducted to the charge in favour of silica material. Consequently, the adoption of silica retorts facilitates higher working temperatures, shortening the period of distillation, and increasing the output per retort by 57% over retorts of firebrick construction, without taking into account the higher coefficient of conductivity of silica and the thinner retort construction possible with this material. Thus it is the temperature effect rather than the quantity of heat that is conducive to rapidity of carbonization.

The appreciably higher capital costs of silica settings, together with the exceptionally high expansion coefficient of this material which so complicates the construction of settings of this type, tends to prejudice many authorities who consequently favour the adoption of high-grade siliceous material in the construction of retort settings, with a less rapid rate of carbonization, as the most economical proposition.

It would appear rather remarkable that while the first and last factors of heat conductivity—*i.e.*, increased temperatures and increased conductivity coefficient of retort material—have received such consideration, the second factor, the area transmitting the heat, has been sadly neglected; indeed, the only consideration this factor appears to have received has been a consideration of possible increase of superficial area, either by increasing the size of the retorts or decreasing the width of the supporting or division walls. A consideration or review of the temperature conditions existing within the heating chamber of the setting having a combustion chamber temperature of, say, 1350° C., will illustrate the importance of this factor of "area transmitting heat," bearing in mind that this transmission of heat is directly proportional to the temperature between the outer and inner surfaces of the retorts.

Considering a setting of ten retorts in two tiers of five, with a combustion chamber temperature of 1350° C., it will be found that there is a drop of approximately 100° C. in the upward passage of the products of combustion to the region of the top retort, the temperature at the top of the heating chamber being, say, 1250° C., making a mean or average temperature of 1300° C. on the combustion chamber side of the retorts. On the main wall sides of the two tiers of retorts a temperature of approximately 1200° C. is found in the region of the top retort, this temperature falling to 950° at the base of the heating chamber (*i.e.*, inlet to recuperator flues), so that the mean temperature of the outer surfaces of the retorts on the wall side is 1075° C.

Since the combustion chamber halves of the retorts are isolated from the wall sides of the retorts by a series of partition walls, it is feasible to assume that one half of the heating surface of the retorts has an average temperature of 1300° C., whilst the other half is at 1075° C., making a mean heating chamber temperature, or mean retort outer surface temperature, of 1188° C., and with coke temperature as assumed at 900° C., a difference between the outer and inner retort surfaces of 288° C. Thus it is seen that with a minimum margin of safety permissible with high grade siliceous material, which facilitates a heat transmission factor of 400° C., only 288° C. is available in practice, due to inefficiency of heat application to the retorts. Consequently the equivalent heating surface of the retorts is reduced by approximately $400 - 288 = 112 \times \frac{100}{288} = 40\%$. In other words, the output or carbonizing capacity of the setting is reduced by approximately 40% of the maximum capacity governed by the refractoriness of the retort material.

Rapid penetration of heat is necessary for a smaller, uniform-sized combustible coke, and if this can be obtained with the avoidance of exceptionally high local heating with a consequent avoidance of excessive degradation of the tars an increased thermal yield and higher general carbonizing efficiency results, and, with the utilization of the total heating surface for transmission of the maximum possible heats allowable with the grade of refractory concerned, an increased carbonizing capacity (up to, say, 40%) of the plant is possible.

INTRODUCTION OF MULTIPLE STAGE "TERTIARY AIR" COMBUSTION SYSTEM.

Realization of these salient facts led the author to an investigation of the problem with a view to suggesting a remedy, the culmination of which was the introduction of a system of delayed combustion to horizontal and inclined retort settings whereby heat treatment is effected by multiple stages.

Uniformity of heat treatment in the heating chamber of the setting is effected by restricting the secondary air supply to the heating chamber so that the primary stage of combustion at the point or zone of egress of the fuel gases to the heating chamber is only partially effected. The unburnt fuel gases circulate with the products of the first stage of combustion, up through the heating flues to the region of the upper retorts where a further supply of air or preheated air, which may be conveniently termed the "tertiary air supply" is admitted through appropriate ports terminating the preheating flues of a system of recuperation, and the completion of combustion of the excess fuel gases results, the products of the complete combustion leaving the flues of the heating chamber by way of a system of recuperation to the main flue.

CONTROL.

The control of the combustible gases; primary, secondary, and tertiary air supplies and products of combustion, is effected by appropriate valve, slide, or damper control. The tertiary air may be introduced to the heating chamber by ducts or flues through the top of the setting, terminating at points of ingress by nostrils or ports.

Figs. 1 and 2 are a fragmentary front view partly in section and a longitudinal cross-section of a horizontal retort setting illustrating an embodiment of the tertiary air feature, the air for the multiple stage combustion being preheated by a system of recuperation and conducted by way of vertical flues or ducts constructed in the main walls of the setting, these ducts leading to longitudinal collecting flues, making connection with the flues of the heating chamber by means of the nostrils or ports.

RECUPERATION.

It will be noted that advantage has been taken of a well-known design of recuperator system to utilize a portion of the usual secondary air flues for preheating the tertiary air supply, as in this method of heating the actual secondary air is considerably curtailed so that the gaseous fuel is only partly combusted in the central combustion

*From a paper before the London and Southern District Junior Gas Association, Dec. 8, 1933.

chamber into which the preheated secondary air is admitted as in usual practice, through ports situated adjacent to their respective gaseous fuel nostrils.

The usual central combustion chamber is the zone of ingress of the total gaseous fuel for all stages of multiple combustion. The partially burnt gaseous fuel encounters

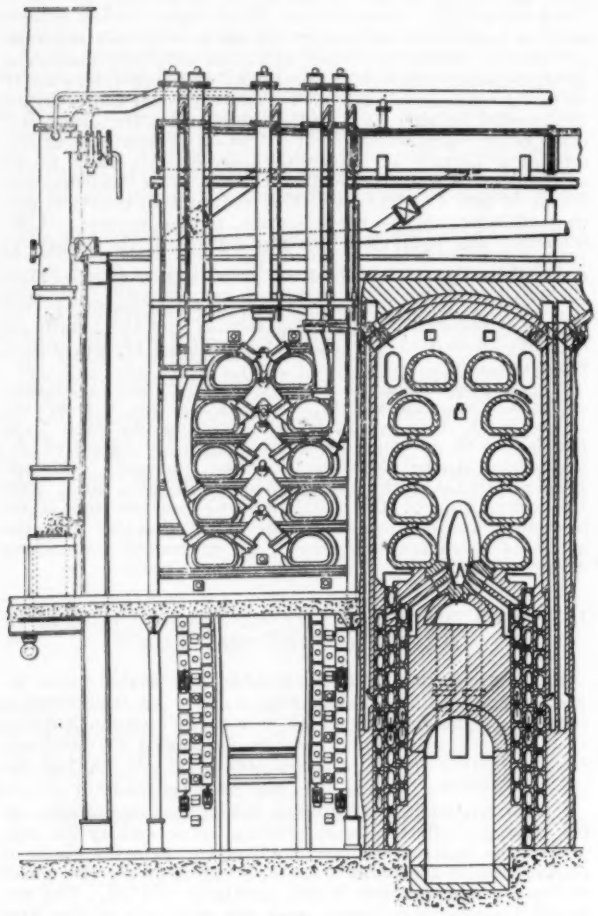


Fig. 1.

the preheated tertiary air supply at the top of the heating chamber and further combustion results.

TERTIARY AIR FLUES.

The tertiary air uptakes constructed in the main walls of the setting are similar in construction to the recuperator flues, and are, in effect, extensions of the recuperator flues. They are protected by rebated silica tiles constructed into the main walls as shown. Access to these uptakes is available from the horizontal and longitudinal collecting flues which are situated in the spandrils of the setting and extend from back to front thereof, access to these being afforded for inspection and cleaning by inspection ports. In a setting constructed on this design in a London gasworks it has been found advisable to construct these longitudinal collecting flues of silica in tubular form in order that they shall be as "tight" as possible, since a pressure of approximately 8/100ths in. W.G. is developed as the result of the "stack" effect of the vertical flues. Leakage from these longitudinal flues would be undesirable since this accumulated pressure considerably reduces the "pull" necessary on the setting to enable the tertiary air to counter the pressure accruing at the top of the heating chamber of the setting resulting from the primary stage of partial combustion.

OVERHEAD RECUPERATORS.

In the embodiment illustrated in fig. 3 the tertiary air is preheated in an overhead recuperator. Part of the waste gases from the heating chamber passes into the waste gas flues of the usual type of secondary air recuperator system for preheating the secondary air, while the remainder passes up vertical uptakes into the overhead recuperator waste gas flues which are disposed above the tertiary air preheating flues into which the air enters by suitable inlets through control valves, being directed by longitudinal and transverse baffle walls to the ports or nostrils opening into the top of the heating chamber.

This overhead type of recuperator for preheating the tertiary air supply was designed primarily for those settings having an overhead main waste gas flue and where the secondary air passes through a series of baffles situated between the base of the heating chamber and the internal producer arch. It would not be an economic proposition to combine both overhead and ordinary type recuperators in the construction of a setting. In the case of settings having the ordinary secondary air recuperator system an economical proposition for the introduction or adaptation of the tertiary air system would be to construct the tertiary air flues only of the overhead recuperator illustrated so that the air is preheated by radiant heat from the top of the heating chamber, thus affording considerable conservation of thermal energy by minimizing radiation losses from the top of the setting.

MODUS OPERANDI.

The method of operation of the tertiary air setting is generally similar in principle to that of the ordinary horizontal or inclined setting.

Proceed to gaseous firing in the usual manner, setting the primary and secondary air slides to give a predetermined temperature in the central combustion chamber. The products of combustion at this stage are to be of high carbon dioxide content.

The tertiary air slides are then opened, and the primary air slides are also opened more fully to allow an excess of gaseous fuel to pass forwards in an uncombusted state (with the products of the first or partial stage of combustion occurring as aforementioned in the central combustion chamber) in an upward direction between the rows of retorts, passing over the top retorts of the setting, and finally in a downward direction along the side main walls of the setting. The tertiary air supply admitted at these points as prementioned will then complete the desired sub-

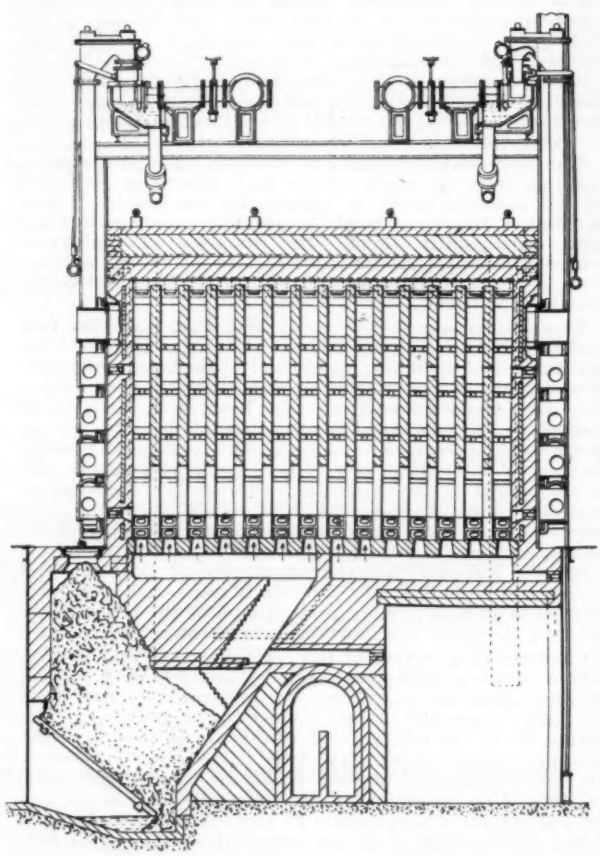


Fig. 2.

sequent stages of combustion of the excess of fuel gases in the desired proportions.

The final slide, damper or valve adjustments controlling primary, secondary, and tertiary air supplies, and the products of the multiple stages of combustions and draught for efficiently effecting same may then be proportioned

according to the temperatures and conditions of the heating chamber prevailing, and the analysis of the furnace gases after complete combustion.

REDUCED TEMPERATURE MAXIMA—LONGEVITY—CHEAPER CONSTRUCTION.

The advantages of this tertiary air system may be defined as a means whereby the working life of the setting is increased by a reduction in temperature maxima in the heating chamber of the setting. A reference to the disposition of heats obtained by the introduction of this system may be illustrated by again considering a setting of ten retorts in two tiers of five, with a combustion chamber (central) temperature of 1350° C., which, as aforementioned, drops to a temperature of approximately 1250° C. in the upward passage of the hot gases to the region of the top retorts. At this point the tertiary air supply completes combustion of the partially combusted fuel gases, raising the temperature once again to 1350° C.

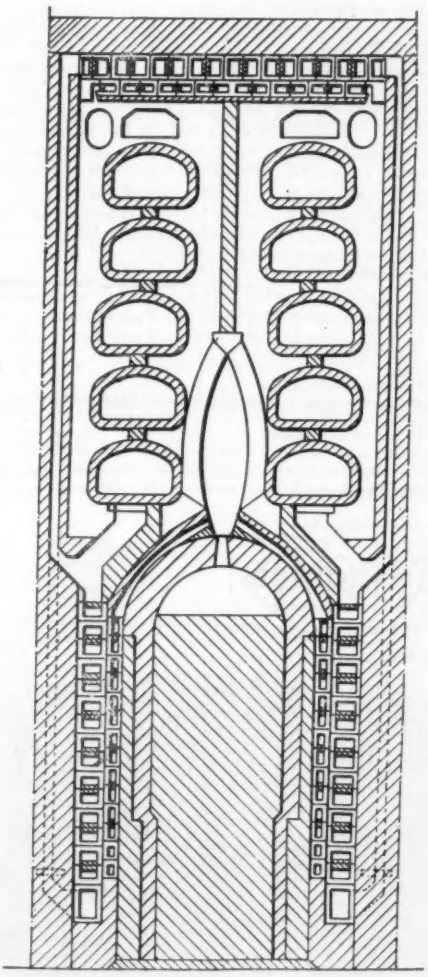


Fig. 3.

(a temperature rise of 100° C.), and once again there is a temperature drop of 100° C. in the downward passage of the combustion products to the recuperator flue inlets, the waste gases at this point being approximately 1250° C. (This is an established fact, actually confirmed in practice.) Thus the mean heating chamber temperature is 1300° C., well within the margin of safety for ensuring longevity of the setting with high-grade siliceous material. In other words, the maximum heating superficial area of the retorts is subjected to this mean temperature, against a mean heating chamber temperature of 1188° C., as previously indicated in the case of the ordinary method of heating these settings. Consequently the next advantage is an increased carbonizing throughput of approximately 40% with the adoption of the tertiary air system. To attain a mean heating chamber temperature of 1300° C. with the ordinary method a combustion chamber temperature of approximately 1500° C. would be necessary. Only an all-silica setting could be expected to stand up to such a temperature, working practically without a margin of safety. The extra high capital cost of these installations over the siliceous installation is well known together with the attendant constructional difficulties arising from the high coefficient of expansion of silica. The excessive cracking of tars, stopped ascension pipes, inferior coke, &c., are a few of the troubles to be expected with chamber temperatures of 1500° C. Therefore, the tertiary air system permits all the desirable features of a high mean chamber temperature with none of the attendant undesirable features mentioned, and the cost of constructing the settings would be considerably lessened.

The avoidance of high maximum temperatures (experienced in the heating chambers in settings featuring single-stage heating) minimizes the cutting and impingement of the flames, with a consequent elimination of the fusion of the retort refractory material, &c. Hence a decrease in the cost of repairs and maintenance of the plant is assured.

INCREASED THERMAL INSULATION.

A considerable thermal insulation at the top of the setting by the prevention of heat losses by radiation at this point is assured in particular by the overhead system of recuperation as described, this thermal conservation being effected by the preheating of the tertiary supply of air for the multiple stages of combustion within the heating chamber of the setting. Additional consumption of gaseous fuel which would be otherwise necessary for this purpose is thus avoided, and consequently the overall thermal efficiency of the plant is increased.

IMPROVED COKE.

The decreased period of distillation of the coal with the avoidance of maximum or local heating produces a residual coke which has the highly desirable characteristics as a domestic fuel of small cellular construction and thin walls with higher combustibility and reactivity properties.

GRATE AREA AND FLUE AREA, &c.

With an efficiently constructed setting having ample grate area in the producer (at least 1·5 sq. ft. per ton of coal carbonized per 24 hours with "step" grates); a sufficiency of heating flue area, particularly on the main wall side of the retorts, for the increased volume of gaseous products at higher temperatures; provision for increased superficial flue area for recuperation and sufficient main waste gas flue area to accommodate the increased volume of gaseous products at a higher temperature, a higher thermal efficiency is obtainable with the introduction of the tertiary air system of heating retorts, and a definite saving on the fuel to producers PER TON OF COAL CARBONIZED.

There is a 28·4% saving of fuel per ton of coal carbonized by the introduction of tertiary air heating allowing an 85% recuperator efficiency.

The effect of recuperation in connection with the tertiary air system, allowing an efficiency of, say, 85% recuperation, represents a corresponding saving of:

$$\frac{1800 \times 85}{7980 \text{ (C.V. of fuel)}} = 19{\cdot}2\%$$

in the amount of coke required to heat an ordinary generator setting; and in comparison with the saving effected of 15·2% in the case of an efficient ordinary recuperative type of setting a further increase of:

19·2 − 15·2 = 4·0% more fuel saved by increased recuperation.

WASTE HEAT BOILERS—ECONOMICAL PROPOSITION.

An additional advantage facilitated by the introduction of this system is the possibility of incorporating a system of heat recovery by waste heat boilers as a decidedly economical proposition, on account of the higher waste gas temperature available for steam raising purposes even after the maximum recuperation of waste heat by preheating the air for secondary and tertiary combustion; whereas with a highly efficient system of recuperation without the multiple stage combustion the waste gas temperature after recuperation has made the question of introduction of waste heat

boilers in connection with horizontal settings a rather doubtful economy.

REDUCING ATMOSPHERE IN RETORT SETTING.

Working settings in a reducing atmosphere has been viewed rather dubiously in the past owing to the disintegration of refractories in the presence of carbon monoxide, the said disintegration occurring as the result of an increased volume caused by the deposition of carbon upon refractory material from the following reaction: $2CO = CO_2 + C.$, but as the deposition occurs between temperatures of approximately 350° and 700° C., according to the 22nd Report of the Refractory Materials Joint Sub-Committee, there would appear to be very little ground for pessimistic views on this point considering the considerably higher temperatures prevailing.

EFFECTS OF INCORPORATION OF "TERTIARY AIR" PRINCIPLES UPON EFFICIENCY OF CARBONIZATION.

In order to illustrate the effect on the thermal efficiency of a horizontal installation by applying the tertiary air multiple stage combustion system, an approximate heat distribution balance is given below for installations featuring recuperators in conjunction with the "tertiary air system" in comparison with "generator settings" without tertiary air.

General carbonizing conditions are assumed, allowance being made for radiation losses and a producer efficiency of 90% on the "hot gas" basis. The percentage constitution of the fuel is as assumed for previous calculations illustrating the disposition of heat in settings.

Publication of actual heat balances of installations recently erected and in operation having the "tertiary air" principles incorporated, unfortunately, is inopportune, but generalizing, they closely approximate to the thermal balances given, neglecting radiation discrepancies which, of course, are largely dependent upon design and construction. There has been a general tendency to make inadequate allowance in design for increased recuperator superficial area—grate area—and flue area, with consequent heat losses due to excessive draughts necessitated.

I have endeavoured to stress the importance of these matters in this Paper, particularly the high recuperation efficiency necessary for maximum fuel conservation.

Approximate Thermal Balance of Horizontal Settings representing a Comparison between a "Recuperator Setting" incorporating the Tertiary Air System; and a "Generator Setting" without Tertiary Air.

	Recuperator Setting with Tertiary Air Applied.			Generator Setting Without Tertiary Air Applied.		
	Calories.	% Available.	% Used.	Calories.	% Available.	% Used.
Calories per gram of fuel supplied to producers	7981	100·0	100·0	7981	100·0	100·0
Calorific intensity of products of 1st stage combustion	2200	27·6		2200	27·6	
Allow 10% rad. loss and heat in ashes	223		2·8	223		2·8
Heat utilized to raise temperature of products of 1st stage of combustion	1977		24·8*	1977		24·8*
Production of heat in setting; 2nd stage combustion	5438	68·1		5781	72·4	
Allow 10% rad. loss, &c.	544		6·8	578		7·2
Cals. required to raise temp. of air for 2nd stage combustion	158		2·0	1770		22·2
Heat utilized to raise temp. of products, 2nd stage combustion	4736		59·3*	3133		43·0*
Production of heat in setting; 3rd stage combustion	343	4·3		..	..	
Allow 10% rad. loss	32		0·4	..		..
Cals. required to raise temp. of air for 3rd stage combustion	11		0·1	..		..
Heat utilized to raise temp. of products, 3rd stage combustion	300		3·8*	..		..
Total heat available in chamber	7013	87·9*		5410	67·8*	
Heat used for carbonization	3023		37·9	2355		29·5
Total heat available in waste gaseous products	3990	50·0		3055	38·3	
Heat required for natural draught; say at 315° C.	889		11·1	889		11·1
Heat available for steam raising and recuperation	3101	38·9		2166	27·2	

[A report of the discussion will be published next week.]

"Armco" Iron for Gasholders

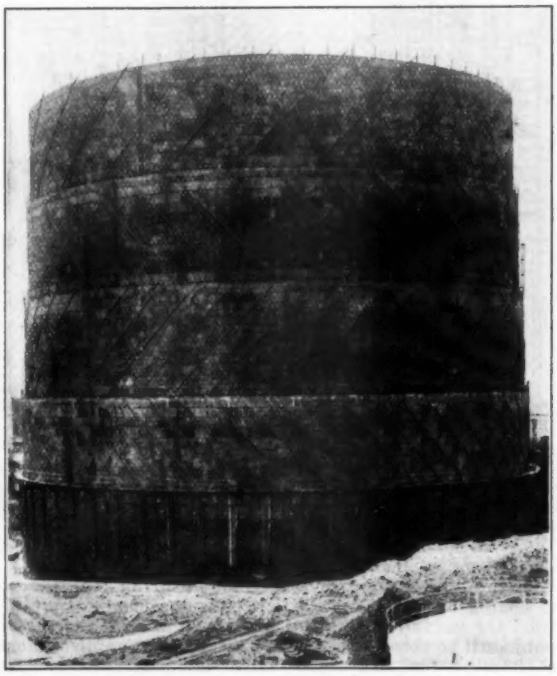
The opinion is widely held that a reduction in maintenance costs of gasholders and general gas-works equipment has been secured by the adoption of "Armco" ingot iron—commercially pure iron for constructional work. Time and actual service in the Gas Industry have conclusively demonstrated the ability of this pure iron to oppose corrosive influences. By its consistent purity and uniformity "Armco" ingot iron has established itself as one of the most suitable and economical metals for all constructional work where corrosion resistance is of paramount importance.

For over three decades "Armco" ingot iron has proved that its durability compares favourably with the old irons whose lasting properties are well known. In the manufacture of plates, sheets, and sections, chemical and physical uniformity are essential functions of reliable service. Localized segregations and irregular analyses of carelessly made steels inevitably cause disappointments and uncertainties in service. "Armco" ingot iron is produced under strict technical supervision throughout its manufacture to an exacting analysis, thus ensuring a high standard of purity and homogeneity.

Scores of gasholders throughout the world sheathed with "Armco" ingot iron are monuments which attest the low cost of upkeep with consequent economies which this material makes possible in the construction of gasholders. Its freedom from occluded gases, combined with its velvety surface, gives the iron particularly good paint holding properties. Its characteristic freedom from impurities and gases also makes this pure iron a highly satisfactory medium for electric or gas welding.

Working properties and ductility of ingot iron are also advantageous properties which assist in its fabrication.

It may be noted that Armco, Ltd., with offices at Thames House, Millbank, S.W. 1, has been organized to succeed the Armco International Corporation in England.



5,000,000 c.ft. Spiral Guided Gasholder completed in 1933 for the Plymouth and Stonehouse Gas Light and Coke Company.

"Armco" Ingot Iron (approximately 350 tons) was used exclusively for the lifts and crown.

Industrial Co-Partnership Association.

Results of the New American Labour Code.

Sir David Milne-Watson, LL.D., D.L., presided at the monthly luncheon of the Industrial Co-Partnership Association held at the Holborn Restaurant, Kingsway, W.C. 1, on Dec. 7. Among those present was the Rt. Hon. J. R. Clynes.

The speaker on this occasion was Mr. Harold Butler, C.B., Director of the International Labour Office, who discussed some of the results of the recently introduced labour code in the United States of America, whence he had just returned. The changes which were at present taking place in America, he said, were of such great importance, not only to the States but also to the rest of the world, that he would confine his remarks to what was taking place there in the industrial field.

The task of the International Labour Office was to set a fair standard of competition between nations. In America, however, no limitations existed, and any agreement as to price or anything else was prohibited. Labour legislation was very partial and uneven. In some of the more highly industrialized States there was a fair standard set by law; but in other States—some of which in recent years had become considerably industrialized, particularly in the south—very little labour legislation existed. Only in two or three industries were wages set by collective bargaining, with the result that every employer had the right to determine what he was going to pay his workpeople—quite irrespective of what his competitors were paying. These were important facts to bear in mind when judging the results of the National Recovery Act.

In the United States unemployment had always been regarded as a matter to be relieved by charity. That view, however, had been entirely changed; so much so that at the present time the American Government was relying to a substantial extent—and, in the opinion of most economists, rightly—upon increasing the volume of Federal relief of the unemployed as one of the indispensable methods of reinforcing purchasing power and of getting industries back into activity. Anyone visiting the United States must come away with the impression that, in spite of what had been said against it, the unemployment system in this country had been a stabilizing influence during the depression.

Points Dealt with in the Code.

When the codes came to be drawn up, the Government opened them to public hearing. The following points were dealt with: The elimination of unfair practices, which imposed burdens on many industries; the stabilization of conditions of production; limitation of the hours of work to forty or less per week; the establishment of a minimum wage; the abolition of child labour; and the establishment of the right to collective bargaining.

Having outlined some of the results of the code in various industries, Mr. Butler said that it was thus an attempt to provide help industry by industry, though it was impossible to say at this stage how it would work out in the long run. The situation was certainly better than last March, however; the employment figure had gone up—it had been 56 in March, whereas to-day it was 74. In the cotton industry 140,000 new operators had been taken on, and in the steel industry 73,000.

What was impressive, said Mr. Butler in conclusion, was the unanimity with which industries went into the code at the beginning and the tremendous energy shown by administrators in regard to all parts of the code. And when one realized what had been accomplished in five months in a country such as the United States one was bound to feel a great deal of admiration. Although conditions in America were different from those in this or any other European country, there was no reason why such a system should not have at least a partial application elsewhere.

Sir David Milne-Watson thanked Mr. Butler for his extremely interesting address, and, in reference to the Industrial Co-Partnership Association, he remarked that, although they did not claim to have the complete clue to the solution of labour and other difficulties in this country, he felt that—after long experience of co-partnership in the Gas Industry—it did go a long way towards the solution.

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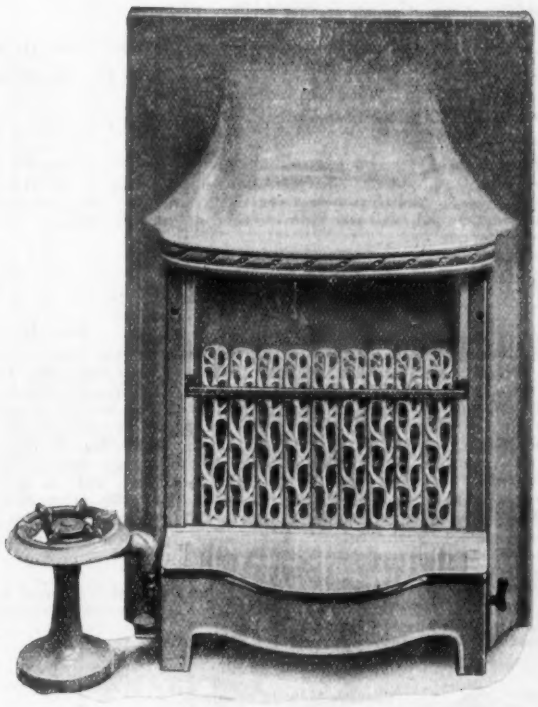

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GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Business generally on the Stock Exchange last week was on a small scale and spasmodic in character, first one and then another section monopolizing attention. The temporary quietude of the exchange position, however, gave a fillip to prices, and the balance of business was strongly in favour of holders. There were several good features, notably Home Rails, mining, and tea shares, while many leading industrials improved in value.

The Gas Market had a cheerful tone, and in contrast to the general position an appreciable volume of business was recorded. Much of this was done at prices above those of the previous week, and this led to several notable improvements in value. The two Hastings ordinaries both advanced 6 points—the 5% converted (7% dividend) to 151½, and the 3½% converted (5½% dividend) to 119½. Imperial Continental ordinary, Mid-Southern Utility 5% debenture, and Shrewsbury ordinary all showed gains of 5 points. European practically recovered the previous week's set-back, advancing 4 points to 124½. On the local Exchange, Sheffield consolidated improved 2 points to 135, and Brighton 5% (6¾% dividend) registered a similar rise to 149½. Business in Gas Light units was done at steadily increasing prices as the week progressed, the highest being 6d. above the previous week's best, though the quotation remained unchanged. At the time of writing a parcel of £5000 of this stock is on offer at 27s. yielding £4 2s. 11d.%. The only falls last week occurred in Montevideo, with a drop of 5 to 60, and in South Shields consolidated, which eased 2½ points to 170½ on the Newcastle Exchange.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Dec.* 11.

There is very little change to report in the tar products market, and current prices are as follows:

Pitch is about 70s. per ton f.o.b.

Creosote, 3d. to 3½d. per gallon.

Refined tar. 4d. to 4½d. per gallon in bulk at makers' works.

Pure toluole, about 3s. 3d.; pure benzole, 1s. 10d. to 1s. 11d.; 95/160 solvent naphtha, about 1s. 9d.; and 90/140 pyridine bases, about 5s. 3d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Dec. 12.

The average prices of gas-works products during the week were: Gas-works tar, 27s. to 32s. Pitch—East Coast, 65s. to 67s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 65s. to 67s. 6d.* Toluole, naked, North, 2s. 6d. to 2s. 8d. Coal-tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 7d. to 1s. 7½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2⅝d.; low gravity, 2d. to 2⅛d.; Scotland, 2⅛d. to 2⅜d. Heavy oils, in bulk, North, 4d. to 4¼d. Carbolic acid, 60's, 2s. 4½d. to 2s. 6d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Dec.* 9.

Business is restricted in this area for want of prompt supplies. Values are well maintained except in pitch, which is decidedly weak.

Crude gas-works tar.—The actual value is 40s. to 42s. per ton *ex* works.

Pitch.—Export value is not more than 62s. 6d. per ton f.o.b. Glasgow. Small quantities *ex* works command 62s. 6d. per ton in bulk.

Refined tar.—A limited amount of business is being transacted at round 3⅛d. to 3⅜d. per gallon f.o.r. in buyers' packages.

Creosote oil.—Prompt supplies are scarce and prices are firm. B.E.S.A. Specification is 3⅛d. to 3¾d. per gallon; low gravity, 3⅛d. to 3¾d. per gallon; and neutral oil 3⅛d. to 3¾d. per gallon—all in bulk *ex* works.

Cresylic acid.—Supplies are now limited and prices are steady. Pale, 97/99%, is 1s. to 1s. 1d. per gallon; dark, 97/99%, 10d. to 11d. per gallon; and pale, 99/100%, 1s. 3d. to 1s. 4d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha is valued at 4½d. to 5d. per gallon *ex* works in bulk, according to quality and quantity.

Solvent naphtha.—90/160 grade commands 1s. 6d. to 1s. 7d. per gallon, while heavy 90/190 quality is quiet at 1s. per gallon.

Motor benzole.—Only small quantities are available. Value is called 1s. 7d. per gallon *ex works*.

Pyridines.—90/160 grade is higher at 3s. 6d. to 3s. 9d. per gallon, and 90/140 grade at 4s. to 4s. 3d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 10	to	0 10½	per gallon at works
Motor ,, . . .	1 5	,,	1 5½	,, ,, ,,
Pure ,, . . .	1 8½	,,	1 9	,, ,, ,,

New Capital Issue.

Bideford Gas and Coke Company.—The tenders for the 1200 of £10 5% cumulative preference shares, which were offered on behalf of the Directors of this Company, were opened on Dec. 7. Tenders were sent in for a total of 3350 shares, at prices ranging from £12 10s. down to the minimum of £11 per share, the lowest accepted tender being at £11 11s. 6d. per share. The average price obtained was £11 15s. 9d. per share.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords

SPECIAL ORDERS.

The Coatbridge, Cirencester, and Cheltenham and District Gas Orders have been considered by the Special Orders Committee of the House of Lords. They have been read, and ordered to lie upon the Table.

Special Order.

Huthwaite Urban District Council.

To empower the Council, for the purpose of obtaining a supply of gas in bulk from the Derby Gas Light and Coke Company at the Blackwell Colliery, to exercise powers with respect to the breaking up of streets for the laying of pipes in certain thoroughfares; to substitute for a charge per 1000 c.ft. of gas a power to charge for thermal units; and to confer upon the Council further powers for the better regulation of the undertaking.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf-Yr. % p.a.	Dividends. Last Hf-Yr. % p.a.	NAME.	Quotations. Dec. 9. (Provincial Exchanges Dec. 8.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Oct. 9	7	7	Alliance & Dublin Ord. ...	122–132	...	128¼–130½
374,000	,,	July 10	4	4	Do. 4 p.c. Deb. ...	90–100	...	...
557,655	,,	Aug. 28	7	7	Barnet Ord. 7 p.c.	167–172	...	170½
300,000	1	Oct. 23	1/9½	1/4½	Bombay, Ltd.	26/–28/-	...	27/6
178,280	Stk.	Aug. 14	9½	9½	Bournemouth sliding scale	192–202	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	163–168	...	...
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	135–140	...	...
50,000	,,	June 26	3	3	Do. 3 p.c. Deb. ...	75–80	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	102–107	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	120–125	...	...
857,900	,,	Aug. 28	7½	7½	Brighton, &c. 6 p.c. Con. ...	160–170	...	167–168
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	147–152	+2	149–151½
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	136–141	+1	141
1,487,500	,,	July 24	5	5	Bristol 5 p.c. max.	113–114*a*	...	...
120,420	,,	June 26	4	4	Do. 1st 4 p.c. Deb. ...	99–101*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	99–100*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	121–123*a*	...	...
855,000	,,	Sept. 25	8	7	British Ord.	155–160	...	156½–159
100,000	,,	June 26	7	7	Do. 7 p.c. Pref. ...	147–152	...	...
350,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	108–113	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	94–99	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	108–113	...	...
160,000	,,	June 26	5	5	Cambridge 5 p.c. Deb. ...	115–120	...	...
100,000	10	May 22	6	4	Cape Town, Ltd.	7–8	...	7⅞–7⅛
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref. ...	6¾–7¾	...	...
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. ...	95–100	...	...
626,860	,,	July 24	6	6	Cardiff Con. Ord.	128–138	...	...
237,860	,,	June 26	5	5	Do. 5 p.c. Red. Deb.	105–110	...	...
157,150	,,	Aug. 14	5½	5	Chester 5 p.c. Ord.	115–125*b*	...	...
98,936	1	Oct. 9	2/-	2/-	Colombo, Ltd. Ord.... ...	1⅜–1⅝	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	19/–21/-	+/6	...
609,204	1	Oct. 9	-/11'48	-/11'48	Colonial Gas Assn. Ltd. Ord.	1⅝–1⅞	...	...
296,053	1	,,	1/8'30	1/8'30	Do. 8 p.c. Pref.	23/–25/-	...	...
1,796,955	Stk.	July 24	6½	5	Commercial Ord.	122–127	...	124–125
475,000	,,	June 12	3	3	Do. 3 p.c. Deb. ...	75–80	...	...
265,272	,,	Mar. 6	—	5	Do. 5 p.c. Deb. ...	121–126	+1	124½–126
807,560	,,	Aug. 14	7	7	Croydon sliding scale	150–155	...	152½–154
469,590	,,	,,	5	5	Do. max. div.	105–110	...	...
500,000	,,	July 10	5	5	Do. 5 p.c. Deb.	120–125	...	...
542,270	,,	Mar. 6	7	10	Derby Con.	170–180*c*	...	...
55,000	,,	July 10	4	4	Do. 4 p.c. Deb.	98–100*c*	...	...
209,000	,,	Aug. 28	5	5	East Hull Ord. 5 p.c.	108–113	...	...
179,500	,,	Aug. 28	6	6	East Surrey Ord. 5 p.c.	127–132	...	130–130½
155,019	,,	June 26	5	5	Do. 5 p.c. Deb. ...	117–122	...	...
1,002,180	,,	Sept. 25	†7	†5	European, Ltd.	122–127	+¼	123–125
19,373,992	,,	Aug. 14	5½	5½	Gas Light & Coke 4 p.c. Ord.	25/9–26/9*f*	...	25/9–26/7½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max. ...	86–89	...	87¼–88½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	102–105	...	103–103½
6,102,497	,,	June 12	3	3	Do. 3 p.c. Con. Deb. ...	82–85	...	82½–84
3,643,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	115–118	...	118
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	112–116	...	113½–114½
270,466	,,	Aug. 28	6	6	Harrogate New Cons. ...	120–125	...	...
82,500	,,	Aug. 28	7	7	Hastings & St. L. 5 p.c. Conv.	149–154	+6	149–152
258,740	,,	,,	8½	8½	Do. 8½ p.c. Conv.	117–122	+6	114–120
140,000	1	Oct. 9	110	1/7½	Hongkong & China, Ltd. ...	29/–32/-	...	29/-
218,200	Stk.	Aug. 14	6	6	Hornsey Con. 8½ p.c. ...	120–125	...	...
5,600,000	,,	Nov. 6	14	10	Imperial Continental Cap.	200–210	+5	200–207½
223,130	,,	Aug. 14	8½	8½	Do. 8½ p.c. Red. Deb.	90–95	...	...
235,242	,,	Aug. 14	8½	8½	Lea Bridge 5 p.c. Ord. ...	170–175	...	...
2,145,907	,,	Aug. 14	6	6	Liverpool 5 p.c. Ord. ...	130–132*b*	...	...
245,500	,,	June 26	5	5	Do. 5 p.c. Red. Pref. ...	103–113*b*	...	...
306,083	,,	July 17	4	4	Do. 4 p.c. Deb. ...	99½–101½*b*	...	...
165,736	,,	Aug. 28	10	8	Maidstone 5 p.c. Cap. ...	180–190	...	...
56,176	,,	July 10	3	3	Do. 3 p.c. Deb. ...	69–74	...	...
75,000	5	Dec. 4	†10	†10	Malta & Mediterranean ...	9–11*	...	...
392,000	—	Oct. 2	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98–103	...	...
231,978	Stk.	Aug. 28	5	5	M. S. Utility "C." Cons. ...	111–116	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	99–97	...	...
112,196	,,	June 26	4	4	Do. 4 p.c. Deb. ...	100–105	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	118–123	+5	...
675,000	,,	21 May '31	†6	†6	Montevideo, Ltd.	55–65	−5	...
2,051,315	,,	Aug. 14	5½	5	Newcastle & Gateshead Con.	25/9–26/9*d*	+/1½	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	101–103*d*	...	...
776,706	,,	July 10	3½	3½	Do. 3½ p.c. Deb. ...	92–94*d*	...	...
277,325	,,	May 8	5	5	Do. 5 p.c. Deb. '43 ...	107–109*d*	...	...
274,000	,,	Aug. 14	5	5	Newport (Mon.) 5 p.c. max.	101–104*a*	...	...
204,940	,,	Aug. 28	7½	7½	North Middlesex 5 p.c. Con.	153–158	...	...
396,160	,,	Aug. 14	5	5	Northampton 5 p.c. max. ...	101–106	...	...
300,000	,,	Dec. 4	7	†9	Oriental, Ltd.	132–137*	...	134–136
316,617	,,	June 26	8	8	Plym'th & Stonehouse 5 p.c.	167–172	...	169–171
504,416	,,	Aug. 28	8	8	Portsm'th Con. Stk. 4 p.c. Std	162–167	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	102–107	...	...
114,000	,,	Aug. 14	5	5	Preston 5 p.c. Pref.	105–110	...	...
686,312	,,	July 24	4	4	Primitiva 4 p.c. Rd. Db. 1911	88–93	...	90½
389,813	,,	June 26	4	4	Do. 4 p.c. Cons. Deb.	88–93	...	90
150,000	10	Sept 25	6	6	San Paulo 6 p.c. Pref. ...	6½–7½	...	...
1,736,968	Stk.	Sept. 11	6	6	Sheffield Cons.	134–136*e*	+2	...
95,000	,,	July 10	4	4	Do. 4 p.c. Deb.	90–94*e*	...	...
133,201	,,	Sept. 11	5	8½	Shrewsbury 5 p.c. Ord. ...	137–142	+5	140–141
90,000	10	June 12	15	14	South African	3–5	...	...
6,709,895	Stk.	Aug. 14	7	5	South Met. Ord.	134–137	...	134½–136
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	137–142	...	140
850,000	,,	,,	20/-*g*	4	Do. 4 p.c. Irred. Pf.	102–105	...	103⅞–104½
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb. ...	80–83	...	82
1 000,000	,,	July 24	5	5	Do. 5 p.c. Red. Deb.	112–116	...	115–116
209,820	,,	Aug. 14	8½	8½	South Shields Con.	170–171*d*	−2½	...
1,543,795	,,	Aug. 14	6	6	South Suburban Ord. 5 p.c.	131–136	...	131–135
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	113–118	...	117–117½
300,000	,,	,,	—	4	Do. 4 p.c. Pref.	100–103	...	...
868,837	,,	June 26	5	5	Do. 5 p.c. Deb.	119–124	...	124
100,000	,,	,,	—	—	Do. 4 p.c. Deb.	102–105	...	...
647,740	,,	Aug. 28	5	5	Southampt'n Ord. 5 p.c. max.	108–113	...	...
121,275	,,	June 26	4	4	Do. 4 p.c. Deb.	99–104	...	...
350,000	,,	Aug. 28	5½	5½	Swansea 5½ p.c. Red. Pref.	107 111	...	...
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	103–108	...	...
1,076,490	,,	Aug. 14	6½	6½	Tottenham and District Ord.	148–153	...	152
300,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	124 -129	...	...
62,295	,,	,,	5	5	Do. 5 p.c. Pref. ...	112 117	...	...
199,005	,,	June 12	4	4	Do. 4 p.c. Deb. ...	98 -103	...	...
85,701	,,	Oct. 9	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	90 -100	...	...
347,769	,,	Aug. 28	7	7	Uxbridge, &c., 5 p.c. ...	144 - 149	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	112 -117	...	115½ - 117
1,322,220	,,	July 10	7	7	Wandsworth Consolidated	153–158	...	157–158
1,096,373	,,	,,	5	5	Do. 5 p.c. Pref.	118–123	...	...
1,317,964	,,	June 26	5	5	Do. 5 p.c. Deb.	120–125	...	...
158,400	,,	Aug. 28	6A	5	Winchester W. & G. 5p.c. Con.	115 –120	...	...

Quotations at:—*a*.—Bristol. *b*.—Liverpool *c*. Nottingham. *d*.—Newcastle. *e*.—Sheffield. *f*.—The quotation is per £1 of stock *g*.—For quarter. *h*.—Paid £3, including 10s. on account of back dividends. *i*.—The interest due 1/7/33 was paid on that date. * Ex. div. † Paid free of income-tax. ‡ For year. Hongkong & China, Ltd.—paid on £10 shares.

COMPANY NOTICES.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company relating to DEBENTURE STOCK WILL BE CLOSED on the 23rd December, 1933, and RE-OPENED on the 1st January, 1934.

By order of the Board,
E. D. DAVEY,
Secretary.

Offices:
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London, E.C. 4,
Dec. 11, 1933.

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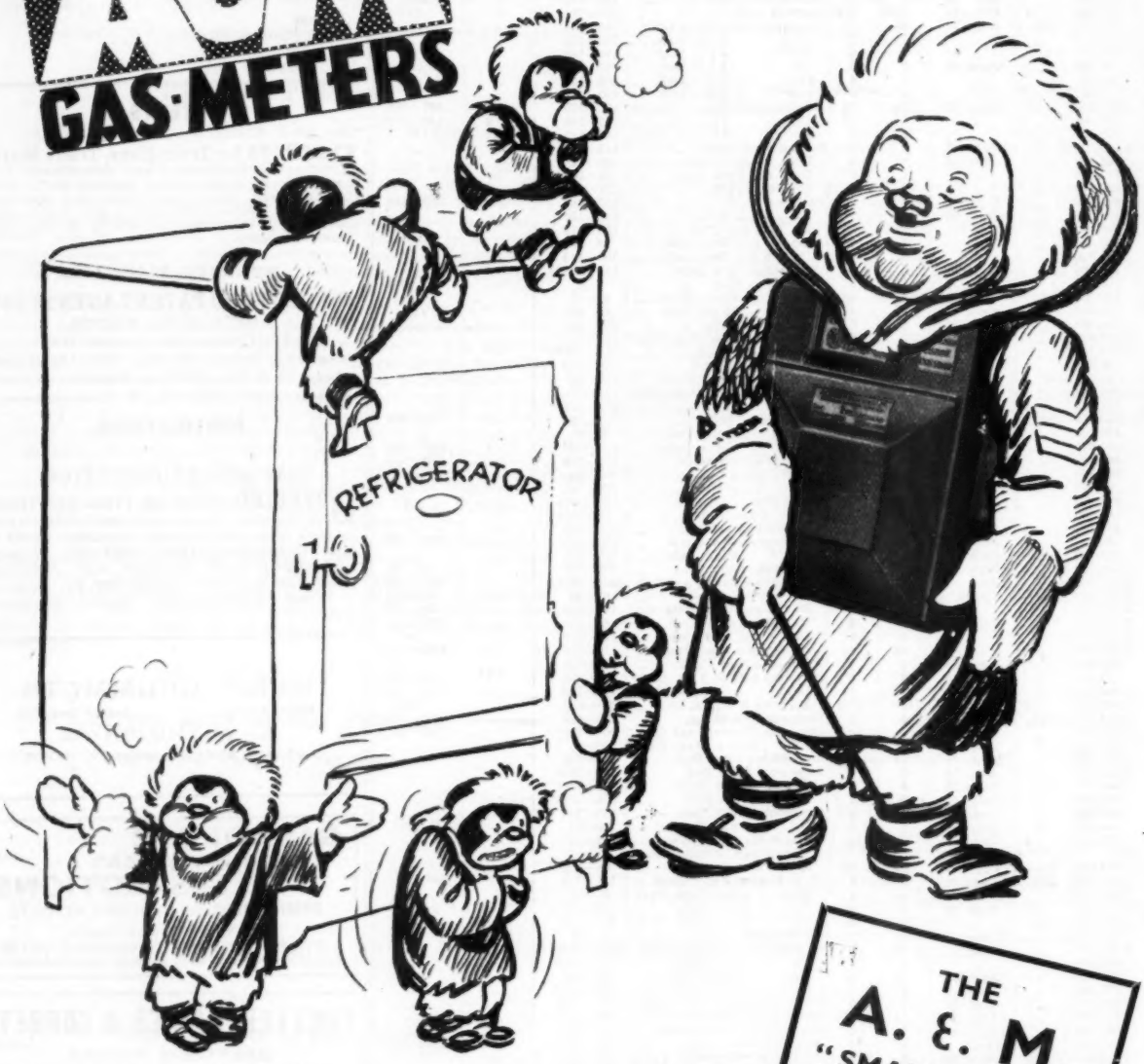

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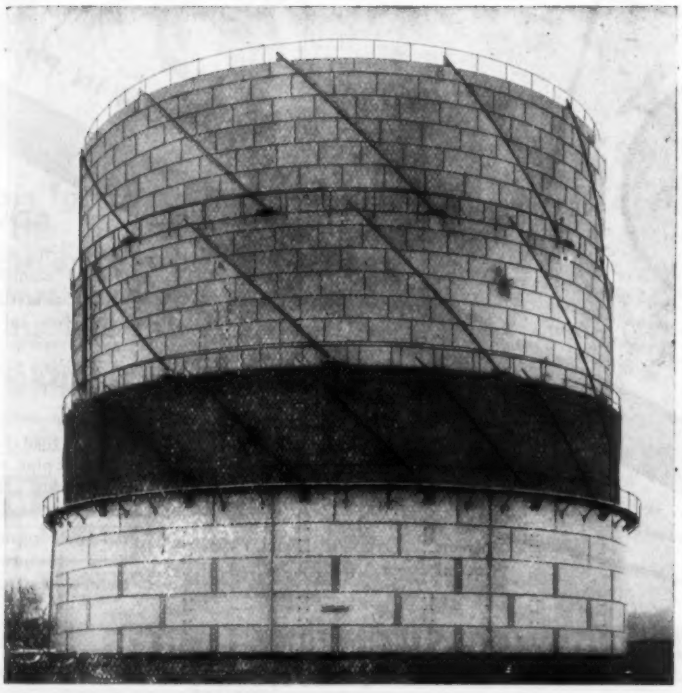

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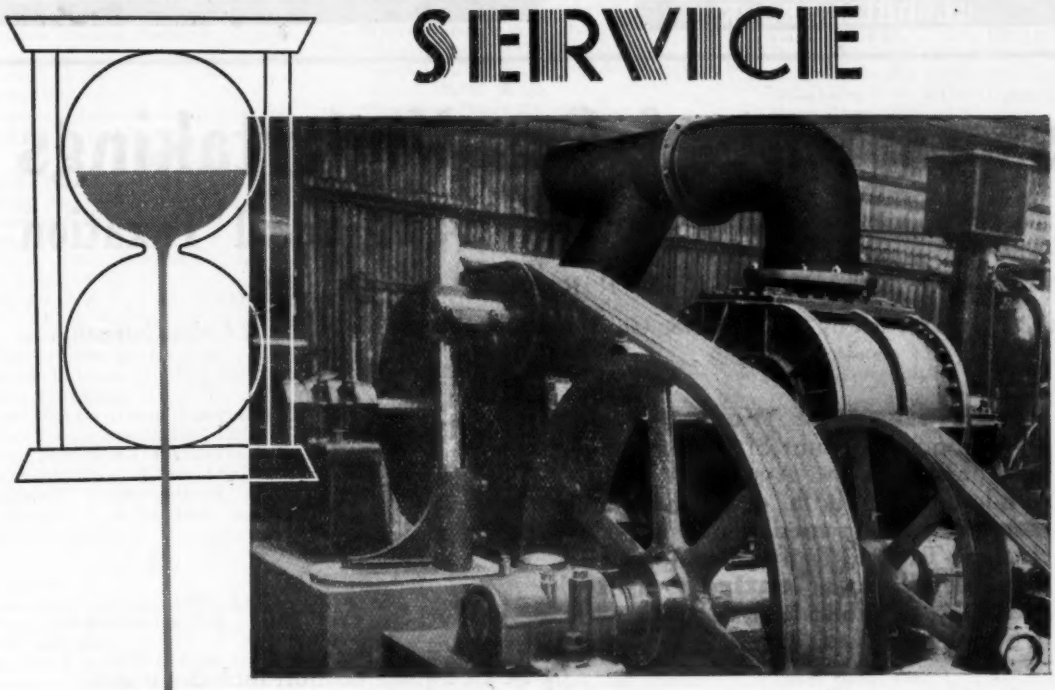

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for Imperial and Local Taxation

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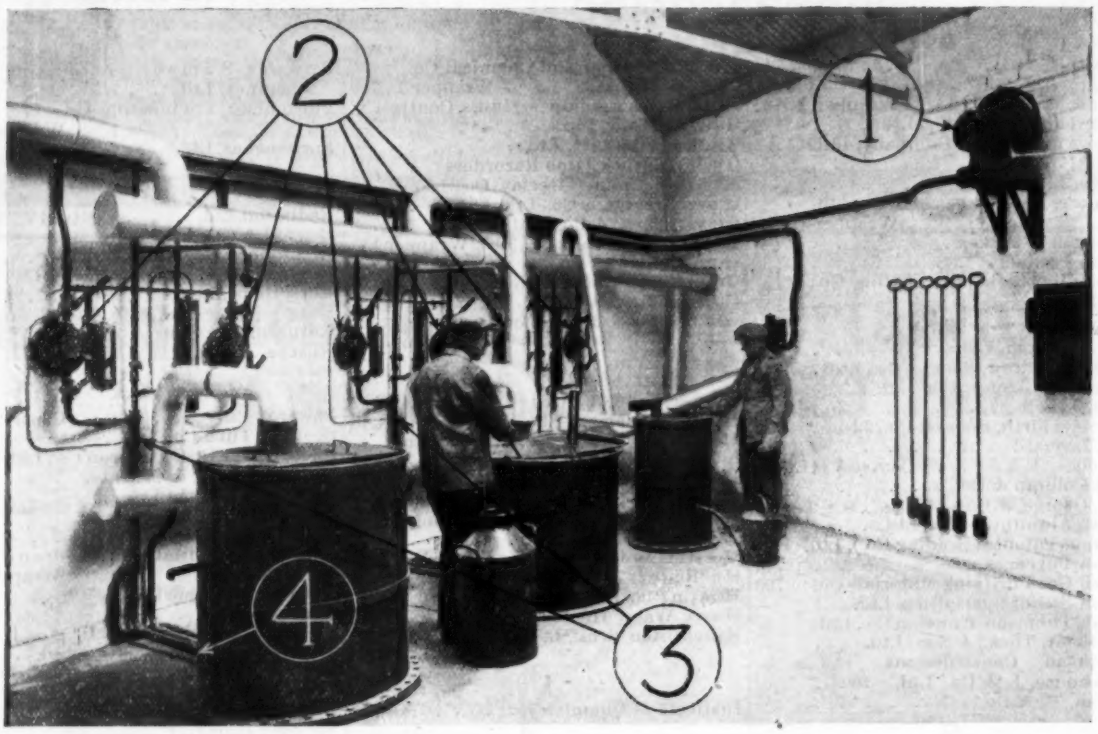

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